Journal

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EDITED BY

COLONEL W. H. HORROCKS,

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ASSISTED BY

MAJOR C. E. POLLOCK,

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VOL. XVIII.

January—June, 1912.

JOHN BALE, SONS & DANIELSSON, LTD.

OXFORD HOUSE,

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

No. 1. January, 1912. Vol. XVIII.

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Printed and Published by

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Price Two Shillings net.

VOLUME XVIII. JANUARY, 1912. No. 1.

Journal
of the
Royal Army Medical Corps.

Original Communications.

A CRITICAL REVIEW OF KALA AZAR AND TROPICAL SORE.[1]

BY LIEUTENANT-COLONEL SIR WILLIAM B. LEISHMAN, F.R.S.
Royal Army Medical Corps.

(*Continued from p.* 580, *vol. xvii.*)

II.—Infantile Kala Azar. *L. infantum*, Nicolle.

THE first cases of this disease were recognized by Pianese and by Cathoire in Italy and by Nicolle in Tunis. In the former country a form of infantile splenic anæmia had long been recognized by Italian physicians, and by some of them its apparently infectious nature had been realized long before the discovery of the parasites. The giant's share in the rapid extension of knowledge as to its association with *Leishmania*, and the mass of experimental and other evidence dealing with the ætiology of the disease, we owe to C. Nicolle and his colleagues at the Pasteur Institute of Tunis, who, during the last four or five years, have issued a long series of valuable reports in the *Archives* published from their Institute.

The earlier cases were mostly isolated cases detected by Nicolle and his associates in or near Tunis itself, but once attention had been drawn to the fact that this deadly disease existed on the Mediterranean littoral, it was not long before numerous additional districts and countries were signalled as infected. It is impossible at present to assign accurate limits to the Western or Mediterranean form of kala azar, since additional foci are

[1] Reprinted by permission of the Editors of the *Quarterly Journal of Medicine.*

continually being made known, but it is obvious, even now, that practically the whole of the countries bordering the Mediterranean are infected in greater or less degree, and, as was suggested in the case of the Indian form, it is probable that a mere fraction of the actual number of cases occurring in these countries is at present brought to light.

The known distribution may be roughly indicated as follows: On the southern shore, Algeria, Tunis, and Tripoli have all been proved to harbour the disease, while Abyssinia and the Sudan are in parts affected by a kala azar which appears to conform more closely to the Indian type. To the east, Syria is said to be heavily infected. Of the countries bordering or adjoining the northern shore of the Mediterranean we have reports of cases from Crete, the Grecian archipelago, Greece, Turkey, Italy, Malta, Sicily, the Lipari Islands, and finally Portugal. Of these, the island of Sicily and the coast of Calabria appear to be most heavily infected, though it may well be that the greater number of cases reported from these localities is more accurately explained as a measure of the interest and enterprise of the local physicians. However far this distribution may eventually prove to be short of the reality, it will be clear that a form of kala azar is at the present moment widespread in Southern Europe, as well as in Northern Africa, and, since it has been found as far north as Rome itself, there may be reason to dread its extension still farther north, if indeed it does not exist already in Central Europe.

It is not certain whether the infantile type exists elsewhere than round the Mediterranean basin, but Jerusalemy speaks of its presence in China, in the province of Nganwei. Until we have more accurate means of distinguishing the two forms than is afforded by the age-incidence and small differences in symptomatology we cannot hope to be certain of this, and it is still far from certain that we have justification for accepting more than one form of the constitutional disease. In India, at all events, cases are met with very frequently in infants and young children, although the disease appears to display a predilection for young adult life; while cases, admittedly rare, have been found in adults in countries affected by the infantile type. For instance, Tashim mentions a case 17 years old at Tripoli, Gabbi one of 18 years at Stromboli, Fulci and Basile a case in a young man of 19 at Rome, and Gabbi another in a man of 38 in Calabria.

However this may eventually be settled, it is undoubted that the enormous majority of the cases occurring in Southern Europe

and Northern Africa affect young children of from 2 to 5 years, and in this respect form a striking contrast to the more advanced age-incidence of the Asiatic type. The sexes are apparently equally susceptible, and no race appears exempt, to judge from the details of the cases published.

Before dealing with the different branches of the subject *seriatim*, it may be well at this stage to indicate the principal points of difference between the Indian and the infantile forms. Briefly these are the following: (1) The infantile attacks almost exclusively young children, while the Indian is met with at all ages. (2) Certain differences of symptomatology have been described. (3) Cultures of the parasites are readily obtainable upon Novy-McNeal medium in the case of *L. infantum* and are easily sub-cultured, while, in the case of *L. Donovani*, cultures on this medium are as a rule unsuccessful, and sub-cultures cannot be made. On the other hand, cultures of *L. Donovani* succeed in citrated splenic blood and usually fail in the case of *L. infantum*. (4) Inoculation of the spleen parasites into dogs and monkeys reproduces the disease in the case of *L. infantum* and fails in *L. Donovani*. (5) A spontaneous infection of dogs has been found in the endemic areas of infantile kala azar, but no such infection of dogs has been encountered in India.

Morphology of the Parasites.—A number of careful studies of the morphology of the parasites, as encountered in the body tissues, have been published. Such descriptions correspond extremely closely one with another and confirm earlier impressions as to the great degree of uniformity of structure observable in specimens taken from cases in different districts and countries. All are in close accord with the earlier descriptions of both *L. Donovani* and *L. tropica*. This morphological identity is emphasized by some, for instance by Visentini, and can be confirmed by the writer, who has been unable to detect any constant differential feature between the three species. Forms indicating the mode of growth and multiplication have been closely studied, and division appears to be commenced by amitotic division of the nucleus, which subsequently extends to the cytoplasm. The great number of parasites frequently found in the cells—up to 200—has given rise to discussion as to how large a part is played by phagocytosis. It appears probable that the first parasites are taken into the cell in this manner, but that intracellular multiplication will account for the larger number. Degeneration forms are spoken of by several, and Tomaselli considers that death of the parasite takes place by a

vacuolization, first of the protoplasm and subsequently of the nucleus, the blepharoplast being the last structure to disappear. In view of the intense vacuolization of the protoplasm exhibited by parasites undergoing rapid development in cultures, the writer is doubtful whether this is to be taken as a sign of degeneration, and whether it may not rather point to an increase in the functional activity of the protoplasm. Forms have been noticed by many observers in which the blepharoplast was absent, and such have been taken to represent a hitherto unrecognized stage of the parasite, degeneration forms, or, as Jemma and di Cristina think, young parasites soon after fission of the mother-cell. The point remains unsettled.

The presence in certain parasites of a third structure in the form of a thread of chromatin substance running from the blepharoplast in the direction of the nucleus, originally noted by Christophers in *L. Donovani*, has since been described by Mesnil and by Novy in *L. infantum*; they consider it to represent a rhizoplast and to stand in an important relationship to the flagellum.

Not infrequently differences in size and shape of the parasites have been mentioned in relationship to the organ from which they were derived; Pianese, for instance, considered that they were smallest in the liver and largest in the marrow, whilst those in the spleen were of intermediate size; from this he suggested that the marrow was probably infected first and the liver last. Other observers, however, do not confirm this difference in size in different organs, at all events as a constant feature in a series of cases.

The blue-staining matrix in which a number of parasites are frequently seen to be embedded is generally accepted as a fragment of the endothelial or other cell in which they were originally contained, but Feletti thinks it may have some nutritive relationship to the parasites which are embedded in it.

Cultures and Cultural Forms.—Artificial cultures of the infantile form were obtained by Nicolle from some of his earliest cases, and he has elaborated cultural methods which have been very successful, both in his own hands and in those of others. Thanks to these methods it has been found possible to make careful investigation of the various stages of the development of the parasites into free-swimming flagellates, and numerous detailed accounts of these forms are now available.

Nicolle first succeeded in his culture of the parasites by employing the medium of Novy and McNeal, which is an agar mixed

with defibrinated rabbit's blood; but he was unable to secure any growth in Roger's medium of citrated splenic blood. The material derived from a splenic puncture was inoculated directly into the condensation fluid at the bottom of a tube of Novy's medium which was kept at a temperature of 20° C. to 22° C. Growth commenced about the seventh day and was abundant by the fifteenth day, numerous masses of parasites in all stages of growth and multiplication being present, the majority flagellated and motile.

Since then Nicolle has simplified Novy's medium by employing only a solution of agar and salt, to which is added fresh rabbit's blood without preliminary defibrination. In this way he dispenses with both peptone and meat extract, neither of which he finds essential. With this modified medium he gets even more rapid and abundant growth and almost invariable success, provided the conditions he lays down are carefully observed. With it he finds growth commencing on the fourth or fifth day and increasing up to the thirtieth day. The formula which is given is the following: Agar, 14 grm.; sea salt, 6 grm.; water, 900 cc.; and he lays great stress on the preliminary purification of the agar from impurities and salts by maceration in cold water. This mixture is then sterilized in the autoclave, without previous standardization and distributed into tubes. The tubes are subsequently melted and then cooled down to between 48° C. and 52° C., at which temperature one-third of their volume of rabbit's blood is added, taken directly by aseptic puncture of the heart. After the mixture has been allowed to set in an inclined position the tubes are covered so as to protect the contents from evaporation and incubated for two or three days, with the double purpose of proving their sterility and encouraging the formation of condensation fluid. After this the tubes should be kept in the dark, and it is best not to use them for some days. They will keep their nutritive qualities for more than a month. Further details have been given by Manceaux of the points which it is well to observe to get the best results from this modified Novy-McNeal medium, or, as Nicolle calls it, "N.N.N. medium."

Another medium has been recommended by Laveran and Pettit as useful when massive cultures are desired for any purpose. The formula of this is :—

Peptone, Chapoteaut	2 grm.	1 vol.
Sodium chloride	6 ,,	
Water	900 ,,	
Rabbit's blood (defibrinated)		1 vol.

The peptone solution is prepared first and poured into small Roux flasks, an equal volume of rabbit's blood being then added. They have not found any advantage resulting from the substitution of sheep's blood or of market preparations of hæmoglobin. The flasks should contain approximately 30 cc. and should be filled to about one-tenth of their capacity. Incubation is carried out at 21° C. to 22° C.

Rogers's method of employing simply the splenic or hepatic blood, kept liquid by the addition of sodium citrate, appears to have failed almost invariably when tried with material containing *L. infantum;* but successful cultivation into flagellate form has been obtained by di Cristina and Cannata, by Longo and by Gabbi. In connexion with this the writer may record that success has by no means invariably followed his employment of Rogers's medium, even when dealing with cases of kala azar of Indian origin.

In most cases the presence of oxygen appears essential for free growth, but di Cristina and Cannata were only able to get development, of a somewhat weak nature, in citrated rabbit's blood on employing anaerobic conditions.

In almost all cases of successful cultivation the material has been derived either from the spleen, liver, or bone marrow of patients or of animals, naturally or experimentally infected, but Novy records a positive result from the inoculation of his medium with the circulating blood of an infected dog. The paucity of the parasites in the circulating blood is against the chances of success in this line, but it is quite possible that, if tried on an extended scale, it might prove a valuable diagnostic method in cases where microscopical examination of the blood failed and splenic or hepatic puncture appeared undesirable.

A great advantage of the methods of Novy and Nicolle lies in the fact that sub-cultures are readily obtainable and that it is possible in this way to maintain in active growth a given strain for an indefinite time. M. Nicolle was good enough to send the writer a culture from Tunis, which reached him, in London, in good condition, and which he was able to carry on through twelve generations, covering a period of over three months, the medium in this case being the original medium of Novy and McNeal.

As to the morphological details of the cultural forms of *L. infantum* no attempt will be made to summarize the mass of work recently recorded, since this would demand a separate article, and, after all, is not of great practical importance: only a few

points will be touched. On the whole it may be said that there is an extremely close relationship between the forms developing from the parasites of Indian and infantile kala azar respectively; indeed, some who have gone closely into this matter state that they are indistinguishable—for instance, Pulvirenti concludes that they are absolutely identical and believes in the unity of the species. The writer has also made a prolonged study of the two forms, contrasting cultures made by himself and by Statham from Indian cases with cultures of *L. infantum* derived from Nicolle at Tunis. He concluded that small morphological distinctions *do* exist between the two, but has not had the opportunity of determining how far these differences are real and how far they may have been attributable to the different media employed in the two cases. One fact of some importance he was able to elicit, namely, that the parasites of Indian origin *will* grow on Novy-McNeal medium, as in one case he obtained development up to the appearance of flagella; the culture, however, was not vigorous and attempts at sub-culture failed.

Di Cristina and Cannata, as a result of their study of the cultural forms of *L. infantum*, think they obtained evidence of a sexual method of reproduction with the formation of cytogametes and gametes, and further details of these are given by Jemma and di Cristina, but their work lacks confirmation and the subject is too complicated to admit of clear summary.

Parasites with two flagella have been seen by many; the writer has only observed them in the case of *L. infantum*, and their significance is doubtful. In the majority of instances it is almost certainly a case of longitudinal fission of a parasite and early appearance of the second flagellum, but other specimens are not so easily explicable. Jemma and di Cristina think that when seen in stained films they are artifacts, since they have failed to notice them in hanging-drop preparations.

The small fillet-shaped segments, apparently the result of unequal longitudinal fission, which were originally described by the writer from a case of the Indian disease, have been figured and mentioned by several of those who have made a study of the infantile form; they doubt, however, whether the granules which these fillets contain are of true chromatin nature and their significance is still uncertain.

The importance of the study of these flagellated cultural forms is not only considerable on phylogenetic grounds and for the determination of the number of species of *Leishmania*, but has, obviously,

an intimate bearing on the ætiology of the different diseases caused by this genus. Although test-tube experiments have their obvious limitations, somewhat unduly emphasized by some, in the opinion of the writer, there can be little doubt that the forms encountered in these artificial cultures are the forms which will be found in the transmitting ecto-parasites and which appear, as will be seen, to have already been found in the case of the infantile form of kala azar. In this connexion the almost universal failure in infantile kala azar to infect by means of cultures—Novy alone has succeded in infecting dogs with massive doses—suggests that before successful infection can take place it may be necessary for the flagellate parasites to assume a post-flagellate form, to follow Patten's nomenclature, and that only in this form can they effect a lodgment in the tissues of their new host. Some support of this view may be found in the fact that the fate of flagellates inoculated into the body is to be speedily phagocyted and destroyed; this has been noticed by Delanoe, and the writer is able to add that he has observed intense phagocytosis of the cultural forms of *L. infantum, in vitro*, when placed in contact with his own leucocytes at a temperature of 37° C. In this case there was no doubt of the destructive action of the cell juices, as the parasites, even when fully formed, motile and flagellated, were rapidly disintegrated, and in a very short time nothing was left but a little granular débris lying in the vacuoles formed in the polynuclears during the process of digestion.

Animal Experiments.—The parasite of infantile kala azar has proved to be capable of infecting animals, and in this respect presents a striking contrast to the Indian form, with which, as has been said, no positive results have so far been obtained. The animals which have shown themselves most susceptible are the dog and the monkey, though slight infections have also been recorded in mice, white rats, guinea-pigs and rabbits. In addition, the very important observation has been made of spontaneous infection in dogs. This spontaneous canine kala azar will be considered separately after the experimental forms of animal infection have been dealt with.

Experimental Infection of Dogs.—Nicolle, as has so often to be recorded, was the first to succeed in this by inoculating some emulsion of spleen tissue, rich in parasites and derived from one of the earlier child cases, directly into the liver substance of a dog and also into its peritoneal cavity. The dog showed no symptoms and, two and a half months later, was given a similar dose from another case. The animal was sacrificed on the 159th day after the first

inoculation, and parasites were found in the spleen and, more rarely, in the liver. This experiment has been repeated by Nicolle and his co-workers on numerous occasions, and has also been confirmed by numerous other workers, the virus being derived either from a human case or from a dog previously infected. A study of these cases, however, makes it clear that the almost invariable success which attended Nicolle's experiments—he mentions one series of eighteen results among nineteen dogs—is not attainable in all instances; for instance, Jemma and di Cristina found many dogs refractory even to massive doses of the virus. It appears extremely probable that differences as regards susceptibility exist in different breeds of dogs, if indeed some breeds are not altogether refractory. As has been pointed out, such differences in susceptibility may in part be accountable for the failure to infect dogs in India.

With the single exception of Novy's experiments, mentioned below, the material used for inoculation has invariably been an emulsion of spleen, liver, marrow, or other organ containing the intracellular forms of *L. infantum;* inoculation of cultures from which these forms are absent has failed. In most instances the original technique of Nicolle has been followed in the mode of inoculation, namely, the simultaneous inoculation of this emulsion into the liver substance and into the peritoneal cavity. Infection has, however, frequently followed inoculaton into one or other site alone, and those who have experience of both methods think the peritoneal channel is preferable and more certain. Numerous attempts at infection by means of intravenous inoculation have failed. Subcutaneous inoculations have also given negative results, at all events as regards the induction of a generalized infection, but Nicolle and others have at times noted a local reaction at the site of inoculation, from which parasites were recovered, which is of interest in connexion with the ætiology of tropical sore; the histological characters, however, of these rare local lesions in no way resemble those caused by *L. tropica.*

The symptoms of experimental infection in the dog correspond closely with those of the spontaneous infection in these animals. The disease may assume one of two forms, an acute form which is often fatal in three to five months and usually occurs in young animals, or a mild form which is very chronic and occurs more often in older dogs. The acute form is accompanied by irregular fever, progressive wasting, motor disturbances involving the hind-legs, occasional diarrhœa, and the animal dies in a comatose con-

dition. In the chronic form, on the other hand, although some of the above symptoms may be present, the animal may show practically no signs of disease and may remain in apparent good health, except for some loss of weight. The existence of the latter type of infection naturally adds to the difficulty of determining whether infection has resulted from the inoculation, and emphasizes the importance of satisfactory methods for diagnosing the disease in dogs. Symptoms being obviously unreliable, recourse must be had to the demonstration of the presence of the parasites in the body. The parasites are almost always present in the spleen, liver, and bone-marrow of infected animals and, though rarely, may also be found in the peripheral blood, especially at such times as high fever exists. The infrequency of their presence in the blood necessitates search being made in one of the other infected organs or tissues. Spleen puncture in the case of a dog is impracticable in view of the impossibility of locating this organ with accuracy. Liver puncture is easy, and is the method usually employed, but it has the disadvantage that parasites may not be found, although a subsequent post-mortem examination may reveal their presence in abundance in the organ. Examination of a sample of bone-marrow is coming to be more frequently relied upon, a small sample being obtained by trepanning the femur or the tibia; in the hands of Italian workers this method has given good results, and it appears of especial value in experiments conducted in areas where the spontaneous disease exists or is suspected, since it is possible in this way to ascertain with a fair amount of confidence that dogs which are intended to act as controls or to serve for infection experiments are normal and free from all traces of infection.

It is possible that cultural methods applied to the blood or to material derived from some organ or tissue may give a positive result even when careful microscopical examination has been negative. Laveran and Pettit, for instance, mention a case in which splenectomy was performed and cultures made from the organ were positive in spite of the failure to detect the parasites in stained films.

The very chronic nature which the experimental form may assume is illustrated by two cases recorded at Tunis, in which the animals died after seventeen and eighteen months respectively, without having shown any marked symptoms; in one of these cases the infection of the organs was found to have been intense. There does not appear to be any relationship between the size of the infecting dose and the subsequent attack; a very small number of

parasites may give rise to an intense and fatal attack, and a massive dose to a mild one, or it may even fail, and this when working with the same virus.

Experimental Infection of Monkeys.—These animals were proved to be susceptible by Nicolle shortly after he had succeeded with dogs, and the method of infection and the character of the attack follow much the same lines in each. On the whole, the symptoms are more manifest, and of seven *Macacus sinensis* inoculated by Nicolle two died within three months. The well-known delicacy of these animals in captivity, even under the best conditions, makes it, however, difficult to judge points such as this. A case was noted in which the animal showed no signs at all during life, but was found after death to be heavily infected. A point of some interest is that in several cases parasites have been detected in the hepatic cells, an extremely rare condition in man, if it ever occurs, and one which Nicolle has only met with once in the dog. Later experiments were carried out with another species of monkey, *Macacus cynomolgus*, which proved to be equally susceptible to *M. sinensis*, and possibly a little more so since in one animal a petechial eruption was noticed in the course of the disease, and this had not been encountered in *M. sinensis*.

Infection of the smaller experimental animals has in most instances failed, but Laveran and Pettit, by inoculating material derived from an infected dog, noticed a slight infection in the case of the mouse, the white rat, and the guinea-pig, parasites being found in mononuclear cells of the peritoneal exudate as late as fifty-nine days after the inoculation. Volpino, too, has recently succeeded in producing a keratitis in the cornea of the rabbit by the inoculation of parasites into the scarified surface of this tissue; three months later the portion of cornea examined was found to contain *L. infantum* in large numbers.

A few other points may be noted in connexion with these very numerous animal experiments. In a few instances opportunity was afforded of examining fœtuses of infected dogs; in no case were they found to be infected, we have therefore, no suggestion of the possible hereditary transmission of the disease in dogs. Splenectomy has been performed during the course of the infection in dogs and monkeys without in any way modifying the progress of the disease. Passage of the virus from dog to dog is readily procurable, and may apparently be carried on indefinitely; no marked alteration in the virulence of the strain is apparent. On the other hand, passage of the virus through monkeys has been found by Nicolle and

Manceaux to result in the diminution of the virulence for the monkey, but not for the dog.

Infection by means of Cultures.—The whole of the experimental work dealt with above was the result of infection with the non-flagellated parasite, as it is met with in the tissues of man and infected animals. Numerous attempts to produce infection by means of the flagellated forms which develop in artificial cultures have been made in Tunis, Sicily, Italy, and elsewhere with universal failure except in the hands of Novy. He thought that the failures might possibly be due to the employment of too small doses, and in consequence gave repeated and large doses to a dog and succeeded in infecting it. The strain with which he worked was derived from Tunis, and had been sub-cultivated through so many generations that it was hardly possible that any of the pre-flagellate forms could have persisted in a living, but undeveloped, state. In all he gave fifteen inoculations to the animal, spread over a period of four and a half months, the doses varying from the contents of 8 to 40 culture tubes: the total amount corresponded to the growth from 270 culture tubes of his medium! The animal remained in good health in spite of this colossal dosage, but when killed was found to be infected, the parasites being numerous in the cells of the spleen and liver, but mostly free. Cultures made from the infected organs were also positive, proving the vitality of the organisms.

Repeating this experiment, he records in a later publication the infection of five other dogs, and that he was able to secure infection by a single inoculation of the material from 20 culture tubes. He recommends for diagnosis during life cultivation of the blood, 10 cc. being collected and distributed over 20 tubes of culture medium.

These observations of Novy's are naturally of great importance, and, as he points out, establish the susceptibility of the dog to cultural infection and complete the chain of evidence regarding the relationship of the parasite to the disease.

Spontaneous Infection in Dogs.—Here, too, we are indebted to Nicolle for the recognition of the important fact that parasites indistinguishable from *L. infantum* occur in dogs and cause in them a disease presenting a resemblance in many ways to the infantile form of kala azar. On finding that dogs were susceptible to the disease on inoculation of the infantile virus, he searched first for evidence of any association between actual cases in children and dogs, and in several instances such information was forthcoming, children who had contracted the disease being found to have lived

in intimate association with dogs, some of which died during this time, or subsequently, of an indefinite disease. Next, he made a systematic examination of the dogs which were destroyed at the *fourrière* in Tunis, and soon found one which harboured the parasites in its organs.

Since then large numbers of dogs have been examined and other cases found. In his first series four infected animals were found in 220 examined, while in a more recent series carried out at Tunis by the Yakimoffs, five were found infected out of 299, a percentage of 1·67.

Search for the existence of this spontaneous infection of dogs was soon instituted in other districts in which infantile kala azar had been found, with the result that, almost without exception, infected animals were detected. In two instances parasites were found in dogs in localities in which infantile kala azar had not been recorded, but each of these announcements was speedily followed by the discovery of cases whose undoubtedly genuine character was demonstrated by the finding of the parasites on spleen puncture. These were, first, Algiers, where Edmond and Etienne Sergent first found nine dogs infected out of 125 examined, a percentage of 7·2, and where Lemaire subsequently found a human case. The second instance was at Rome, in which the presence of the infection in dogs was first recorded by Basile, and not till later was the first human case reported by Fulci and Basile. At the present moment it may be said that in every country in which search has been made and in which infantile kala azar has been proved to exist, spontaneous *Leishmania* infection of dogs has also been found. The only exception so far reported is at Palermo, where infantile cases occur, but in which Jemma and di Cristina examined 300 dogs with a negative result.

The percentage of infected dogs in a given area seems to vary considerably. In an endemic focus of the disease discovered at the village of Bordonaro in Sicily by Gabbi, an investigation of the dogs by Basile showed the heavy infection of 27 out of 33 dogs examined. At Rome, just referred to, Basile found also 16 infected dogs out of 60 examined, but by reason of the diagnostic methods employed was inclined to believe that this was an underestimate of the degree of infection. Alvares and De Silva found 1 infected dog out of 19 in Lisbon, where the infantile disease exists. Nineteen infected dogs were found among 284 examined by Cardamitis in Greece, of which 15 out of 184 were in the city of Athens itself. Critien, at Malta, found 3 infected out of 30

examined, and in this instance also the human infection is known to co-exist with the canine.

Negative results were obtained by Fülleborn with 50 dogs in Hamburg, where there is no suspicion of the human disease, and Donovan's negative results at Madras may also be recalled, though connected with the Indian form, as he has examined 1,150 dogs there without finding any trace of *Leishmania*. Finally, Bousfield found parasites in a dog in the Egyptian Sudan which had been in association with one of the human cases of the kala azar which is met with there, although it remains doubtful to which group these Sudanese cases are to be joined.

Pathological Anatomy.—There is a very close correspondence, if not absolute identity, between the infantile and the Indian forms as regards the distribution of the parasites in the body and the histological changes which their presence causes. As regards distribution, whatever blanks may be noted in connexion with one series of cases could be filled in from the results of another investigator. The sites in which the parasites are most abundant, and in which they seem almost invariably to occur, are the spleen, liver, and bone marrow; but, besides these, they have also been found in the kidney, the lung, the pancreas, the mesenteric and other groups of lymphatic glands. Critien has also recorded finding them in mucous flakes passed in the stools of a three-year-old child at Malta, the first observation of this kind in either form of the disease.

The histological changes induced in these tissues have been the subject of much careful study by Pianese, Jemma and di Cristina, and others, and their results are in the closest agreement with similar studies made on the Indian disease. The irregular distribution of the parasites in a given organ has been remarked on many occasions, and the histological changes in such organs are, as one would expect, largely dependent upon the degree of cellular infection.

The changes in the spleen have been closely investigated, especially by Italian workers, and Pianese considers that the essential features are a well-developed fibro-adenitis, the elastic tissue remaining normal, the cells of the follicles become involuted and assume an epithelioid character; there is also a diminution of the spleen pulp in the areas where the "macrophages" are abundant and the venous spaces appear to be dilated.

Nothing differing from the Indian form has been noted as to the distribution of the parasites and the histological alterations in other

situations. From a study of the experimental disease it appears probable that the endothelial cells of the lymphatics and smaller capillaries of the organ concerned are first invaded.

The comparative rarity of bowel symptoms of a dysenteric character in the infantile form is notable, and this is reflected in the rarity with which intestinal lesions have been mentioned; at the same time, Jemma and di Cristina found the parasites in the follicles of the large intestine in one of their cases, and the observation of Critien has already been mentioned.

Treatment.—Up to the present, the treatment of infantile kala azar stands in no better position than that of the Indian disease, although the' former now possesses the great advantage that dogs and monkeys can be infected and it is therefore possible to carry out on these animals tests of various particular therapeutic measures. Experimentally infected animals have been largely used for this purpose, but, although certain drugs give encouraging results with such animals, nothing but persistent failure seems to follow their application to the sick child. There is, however, no reason to despair of ultimate success, and encouragement may be drawn from the fact that cases of spontaneous cure in children do occur, while it is also possible that the apparent limitation of this form to young children may be partially due to adult immunity, acquired by unrecognized attacks in childhood.

A long list might be given of the drugs which have been tried in recent years, but only a few will be mentioned. No one has a good word to say for quinine, whose failure has indeed come to be looked on as one of the symptoms. Atoxyl has been tested exhaustively on many systems of dosage and interspacing of individual injections, but although some cases appeared to improve there is no record of recovery attributable to its action. Domela, however, appears to have a higher opinion of its value, though the case he recorded could not be claimed as a cure at the time he wrote. Arsenophenylglycin was employed in a fair number of cases but has not been of any benefit, and the experiments which Nicolle and Comte carried out with it in dogs experimentally infected were not encouraging, indeed the disease appeared more severe in the case of the treated dog than in the untreated control.

Electromercurol has been employed by Nicolle and by Cortesi and Lévy, by intramuscular injection, and has been pushed as regards dosage to its limits, but with the usual result of failure. Colloidal electrargol and colloidal thiarsol also failed to do any good when tried by Cortesi. Jemma, however, speaks of the value of

Roentgen rays and believes that the disease is curable. Morpurgo employed small doses of arseniate of soda, but without effect.

The striking results which have attended the employment of Ehrlich's new remedy "606," or dioxydiamidoarsenobenzol, in syphilis and other spirilloses has led to its being tried in many other affections, and hopes were entertained that it might be beneficial in this disease. There are now on record a fair number of cases in which it has been tried, but so far with no better results than have followed other arsenical preparations. At the same time there remains some hope that further experience may prove more satisfactory, since experiments on dogs have apparently shown that this drug, alone of all that have been tried, is capable of killing the parasites, at all events in some instances. In the first of these experiments Nicolle and Conor inoculated 20 cg. into the thigh muscles of a dog of 11 kilos, which had been infected by intraperitoneal inoculation, and in which two successive punctures of the liver had shown the parasites to be increasing. Four days later, puncture of the liver in three places failed to disclose any parasites, and a subsequent trepanning of the tibia yielded a similar negative result. The animal, which remained in good health, was killed on the thirty-fifth day and no parasites could be found in any organ. This result naturally gave rise to great hopes that arsenobenzol might abort the human affection in similar manner, and at Tunis and elsewhere it has been tried on children, but there is no case of recovery up to the present moment. It appears to be in the main a question of dosage. In the case of the dog the sterilizing dose seems to approximate 2 cg. per kilo of body weight, and such a dose would be dangerously near the toxic dose for a human being. Nicolle also points out in this connexion that the experimental disease in the dog is comparatively mild and frequently terminates in spontaneous recovery, while in the child the tendency is towards a fatal issue, and that this fact, in addition to the greater tolerance of the drug by the dog, may explain the contradictory results so far attained. At the same time he thinks that further experience may be more successful and he intends to administer the arsenobenzol in his next cases by the intravenous method; hitherto it has always been given intramuscularly and in doses which could not be expected to be of much service. Further encouragement is to be derived from the good results reported of the action of "606" in tropical sore by Manceaux, and the results of its further trial in infantile kala azar will be awaited with great interest.

Fresh bone marrow, the use of which was advocated some years

ago in the Indian disease, has been tried by Sluka and Zarfl, but appeared useless, and hectine, which was used by both Mara and Conseil, does not appear to be any more reliable, although the case treated by the latter gave some signs of improvement.

Ætiology.—Progress in the elucidation of the mode of infection in infantile kala azar has been remarkable during the last two years, fact has been added to fact and the whole now pieces together in a most convincing manner. It may still be too early to speak of the ætiology as completely clear, but the observations summarized below will show how little doubt can remain that canine kala azar is identical with infantile kala azar and that the transmitting agent is a flea, either the dog-flea, *Pulex serraticeps*, or the human flea, *P. irritans*.

As soon as Nicolle had found that the disease could be transmitted to dogs and had further discovered the existence of the spontaneous infection in these animals, he naturally sought for evidence of any connexion between infected children and dogs. This was speedily forthcoming, as two of the first four cases were known to have lived in close contact with dogs, while in one instance the dog in question had been ill and had died. He suggested, then, the natural hypothesis that some ecto-parasite of the dog might prove to be the transmitting agent between dog and child. It soon became manifest that this association between dogs and infected children was of frequent occurrence and, further, that localities where infantile kala azar was found were also localities in which the spontaneous disease in dogs occurred in endemic form.

It is true that cases in children were found in which no close association with dogs could be proved, and others in which the dogs of the house were examined and found to be in good health; such observations, however, are not surprising in view of what has been said as to the difficulty of diagnosing the affection in dogs and the existence of the chronic and mild form in which the dog shows few if any signs of illness.

Cases were soon on record in which infected animals were found in houses in which the human disease was present or had been present, and this was shortly followed by the discovery of what appeared to be *Leishmania* parasites in fleas taken from infected dogs, as was done both by Basile and by Sangiorgi, the material in each case being derived from Sicily. The demonstration of the pre-flagellate forms of *Leishmania* in the gut of fleas collected from an infected dog, though interesting and suggestive, was more or

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less to be expected, as we already know that at times a fair number of parasites may be found in the circulating blood of the dog, but it was further noted that the parasites appeared to undergo development in the flea, similar to that which takes place in the culture tube. This latter fact added to the probability that the flea was a true intermediate host. Further search was made in fleas collected in endemic areas of the human disease, not from infected dogs, but from the coverlets, pillows, and mattresses of houses in the affected areas, and in a certain small percentage of these protozoal organisms resembling the cultural forms of *Leishmania* were found. Sangiorgi, for instance, found such organisms in fourteen out of 378 dog-fleas collected in Catania, and Basile had a similar result with fleas collected from mattresses, &c., in Bordonaro, the village in which both the human and the canine affections are so frequent. Further confirmation came from Lisbon, where Alvares and Da Silva found all stages of *Leishmania* in a flea taken from an infected dog; they also examined sixty fleas collected on healthy dogs with negative results.

The notorious difficulties connected with the proof of insect transmission of flagellated protozoal organisms were to be anticipated here, for, however close the resemblance of such forms as are found in the digestive tubes of the insect to the cultural forms already known, it is hard to distinguish them from other flagellates which may be common parasites of the particular insect in question. Flagellate parasites have been described in fleas by Balfour, by Patton, by Mackinnon, and if the observations had stopped here there would have remained abundant material for scepticism as to the genuine character of the flea as a true host, but fortunately further proof of an experimental nature has recently been obtained, principally from the work of Basile.

Basile's first experiment, aiming at proof of the infectivity of a flea which harboured *Leishmania* parasites, was conducted in the following way: Fleas were collected from a dog which had been proved free from the disease; these were placed in vessels containing some spleen pulp taken from an infected dog and rich in parasites, and on this some of the fleas fed. After a time, the fleas were killed and dissected, one portion of the gut contents on being searched showed the presence of the parasites. The other portion was emulsified and injected into a young puppy, whose marrow had previously been examined with negative results. The puppy was infected and *Leishmania* parasites were subsequently found in its peripheral blood. It was further noted

that the parasites found in the intestine of the flea were far more numerous than in the spleen pulp on which it had fed, and numerous division forms were seen. The fleas employed in this experiment were *Ctenocephalus* (*Pulex*) *serraticeps*.

A later experiment, and one more closely imitating what might be assumed to occur in Nature, was next carried out. Two pups, which had been born in the laboratory, when 30 days old were placed in a special cage, which had been thoroughly disinfected, after having been proved to be free from kala azar by examination of the bone marrow. The cage was protected by netting fine enough to ensure that no fleas or other parasites could gain entrance from outside, and the temperature was maintained at about 20 C.°, as the experiment took place in the winter. After a few days a dog infected with the disease was placed in the same cage, so that there was no obstacle to its numerous fleas passing to the uninfected pups. Thirty days later, liver puncture of the two pups showed that each was infected, *Leishmania* parasites being found on microscopic investigation. Control pups, from the same litter, remained in good health and showed no infection.

At a later date this experiment was repeated by Basile under somewhat different conditions. Again he employed young pups which had been born in his laboratory, and he took the same precautions to ensure that they were uninfected. When they were about a month old, four of the litter were placed in a disinfected and gauze-protected cage, the two remaining pups being kept as controls. The cages were so situated that no contact with other dogs was possible. In this instance infection was introduced among the dogs, not in the person of an infected animal, but in the shape of fleas which had been collected at Bordonaro, an endemic focus of the disease, from coverlets or mattresses in houses where dogs were kept. Repeated examination of the blood of the dogs and hepatic puncture gave negative results until about two months after the fleas had been admitted to the cage, when two of the dogs were found to be infected. All of them had for some time shown irregular temperatures and were getting thin. Within six days of the demonstration of the parasites in the first two dogs the whole four died, and on examination all were found infected with *Leishmania*. The two control dogs, which had remained in good health, when sacrificed later were found to be completely free from the disease.

Basile concludes from the result of these experiments and the rigorous conditions under which they were carried out that they prove beyond dispute the fact of flea transmission.

Further communications, published in July of this year, gave further evidence in support of the above conclusion and again demonstrated that dogs could be infected at a distance by the bites of fleas collected in a house in which was a case of kala azar. In addition, the important observation was made that not only *Pulex serraticeps*, but also *P. irritans*, were found to contain parasites indistinguishable from the cultural forms of *Leishmania infantum*. Pianese's latest communication, in collaboration with La Calva and Visentino, gives further evidence that both *serraticeps* and *irritans* are concerned in the spread of the disease, and they conclude that the human and canine Leishmaniasis of the Mediterranean are identical, and that these two fleas are the intermediate hosts and the transmitting agents from dog to man, from man to man, from man to dog, and from dog to dog.

Confirmation of part of Basile's work is already forthcoming, since Alvares and Da Silva have found in three fleas taken from an infected dog in Lisbon every stage of *Leishmania*, including fully flagellated forms and typical rosettes; the writer has had the opportunity of examining the excellent microphotographs which they have taken from the gut contents of these fleas and is quite in agreement with the authors that they are indistinguishable from the cultural forms usually seen. In addition to this they made the interesting observation that the parasites are passed in the fæces of the flea; this they ascertained by confining the fleas in a vessel with a glass plate at the bottom on which the fleas voided their excrement; this being subsequently stained and examined proved to contain all the forms seen in the gut, including rosettes. They conclude from this that the mechanism of infection may be similar to that which occurs in the transmission of plague through the bites of *Pulex cheopis*, where, as shown by the Indian Plague Commission, it is probable the fæces passed while the insect is feeding is rubbed into the bite together with the plague bacteria which it contains.

Whether fleas are the only intermediate hosts remains to be proved; there is nothing improbable in the conjecture that ticks, lice, bugs, or biting insects may at times act in a similar manner, but, at the present moment, there is nothing but the slightest evidence tending to incriminate any of them.

(*To be continued.*)

FURTHER INVESTIGATIONS ON THE USE OF SALVARSAN IN SYPHILIS.

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Sufficient has been written by ourselves and others to show that salvarsan has a more rapid effect than mercury on the symptoms of syphilis and that it almost always succeeds where mercury has failed to arrest the progress of syphilitic lesions. We have also shown by its effect on the Wassermann reaction and in causing *Spirochætæ pallidæ* to disappear from such lesions as chancres and condylomata that it is not merely a symptomatic remedy, but a specific one, and that in this respect its action is much more intense than that of mercury. Though we have recognized, with everyone, the very great advantage which would accrue if salvarsan could completely replace mercury, and our investigations have been directed towards ascertaining if this is possible, our results have not so far justified us in saying that treatment by salvarsan alone is sufficient to insure the recovery of every case of syphilis. As we have mentioned in previous papers, we have tried the effect of one injection, intramuscular or intravenous, two intravenous and four intravenous injections respectively on successive groups of cases, our aim being to find the simplest and most effective method of using salvarsan. Some clinical relapses have occurred, however, in each of the four groups and in more cases the Wassermann reaction has either remained persistently positive or has again become so after being converted to negative, so that we cannot say we have yet succeeded in discovering a method of using salvarsan which will invariably insure the destruction of every *S. pallida* in the patient's body.

As it seemed to us probable that relapses after salvarsan treatment were not due to the generation of salvarsan-resistant strains of *S. pallida*, seeing that further treatment of relapse cases with this remedy was just as effective as in the first instance, and and as we inclined to the belief that the first injection of salvarsan did not reach every parasite on account of some being buried in thrombi, &c., we determined to try the effect of an initial full dose of salvarsan followed by nine injections of mercurial cream and, lastly, another full dose of salvarsan. Our object was to destroy every *S. pallida* which could be reached by salvarsan and to

commence a process of repair in sclerosed areas ; to keep up a constant attack with mercury on the previously buried parasites as they became exposed by the vascularization of thrombi, so as to prevent them from causing any more scleroses, and, finally, to destroy them with salvarsan. We have treated eighty-five cases in this manner, but though no relapses have occurred in this group, sufficient time has not yet elapsed to enable us to compare it fairly with others.

Other workers, notably Gennerich and Neisser, recommend the combined use of salvarsan and mercury, and it seems very probable that a method of treatment on these lines will be that adopted in future.

We propose in this paper to indicate, as far as we are able at present, the effect which the more general use of salvarsan is likely to have on the treatment of syphilis in the Army, to mention some points of importance in the technique of administration and to outline a preliminary scheme for the management of cases treated with salvarsan.

Regarding the effect which salvarsan is likely to have on the treatment of syphilis, it is necessary to compare the behaviour of this disease under purely mercurial treatment with that when salvarsan is used, either alone or in combination with mercury, as above mentioned. For this purpose we have examined our notes on such of our cases as had received no treatment whatever up to the time of the first injection of salvarsan and were subsequently kept under observation for four, six and nine months respectively, and have recorded in each case (*a*) whether any recurrence of symptoms occurred after the lesion for which the patient was admitted had healed, and after what interval from the date of the first injection ; (*b*) the average length of stay in hospital on first admission, and (*c*) the average length of stay in hospital on re-admission for relapse. We had eighty-eight cases under observation for four months, seventy-five of these were under observation for two months longer, and forty-five of these were observed for nine months in all. In every case the diagnosis was absolutely assured by combined clinical and laboratory examination.

For comparison with the behaviour of these salvarsan cases, we chose at random eighty-eight recent syphilis case-sheets of patients, treated with mercury only, and extracted from them similar particulars relating to a period of four months ; from the first seventy-five for a period of six months and from the first forty-five for a period of nine months.

The result of the examination is shown in Table I, from which it will be seen that the salvarsan cases not only suffered considerably less from recurrence of clinical signs, and consequently spent a much shorter total time in hospital, but enjoyed a much greater interval of freedom between the first and any further outward manifestations of the disease.

TABLE I.—To Illustrate the Effect of Salvarsan and Mercury respectively in Preventing or Postponing the Recurrence of Active Signs in Syphilis.

Cases under observation for the following periods from the commencement of treatment	Total cases under each kind of treatment	Relapsed within four months		Relapsed between four and six months		Relapsed between six and nine months		Total number of relapses within each of the periods stated		Average interval in weeks between commencement of treatment and first relapse		Average duration of stay in hospital on first admission, in days		Average duration of stay in hospital on re-admission for first relapse, in days	
		"606"	Hg	"606"	Hg	"606"	Hg	"606"	Hg	"606"	Hg	"606"	Hg	"606"	Hg
4 months ..	88	4	68	..	..	..	..	4	68						
6 ,, ..	75*	4*	57*	3	6	..	..	7	63	20·5†	9·25‡	21·5	27·9	15·6	21·7
9 ,, ..	45*	4*	35*	2*	5*	4	1	10	41						

* Each of these numbers is included in those above it in the same column.
† Average calculated from all available cases, viz., 11.
‡ ,, ,, ,, the 75 cases which relapsed.

It is not sufficient, however, that we should merely state the bare numbers under each of the headings we have mentioned; to obtain a correct estimate of the different effects of the two methods of treatment it is also necessary to give particulars of the treatment administered, especially in the case of those patients who were treated with mercury. The result of our scrutiny showed the following:—

I. (*A*) Of the 88 cases treated with mercury and observed for four months:—

(1) Sixty-nine were treated with regular injections of mercurial cream (Hg. gr.i in each), salicylate of mercury (gr.1·5 in each), or partly calomel cream (Hg_2Cl_2 gr.¾ in each) and partly mercurial cream, and 52 of these relapsed at the following periods:—

1	after the 3rd injection	3	after the 8th injection
3	,, ,, 4th ,,	12	,, ,, 9th ,,
10	,, ,, 5th ,,	3	,, ,, 11th ,,
13	,, ,, 6th ,,	1	,, ,, 12th ,,
6	,, ,, 7th ,,		

Of those cases which relapsed subsequently to the sixth injection, in 8 the first course consisted of 6 injections only; of those which relapsed subsequently to the seventh injection, in 1 the first course consisted of 7 injections only; of those which relapsed subsequently to the eighth injection, in 2 the first course consisted of 8 injections; with these exceptions all who relapsed subsequently to the ninth injection received 9 weekly injections in the first course.

The 17 cases under this heading which did not relapse within four months were treated as follows during that period: 2 had a course of 6 weekly injections, a rest of four weeks and then 4 more injections; 10 had a course of 9 weekly injections and no further treatment till the end of the four months; 1 had a course of 10 weekly injections and no further treatment till the end of the four months; 1 had a course of 11 weekly injections and no further treatment till the end of four months; 2 had a course of 9 weekly injections, a rest of four weeks and 2 fortnightly injections; 1 had a course of 9 weekly injections, a rest of six weeks, and 1 further injection.

(2) Five cases were treated with inunctions only, and all relapsed within the four months. Particulars of their treatment up to the date of relapse were as follows: 1 had received 12 out of a course of 42 daily inunctions at the Royal Herbert Hospital, Woolwich; 1 had received 15 inunctions at Windsor; 1 had received 26 daily inunctions at Woolwich, was transferred to another station, and treatment omitted till he relapsed two months later; 1 received 40 daily inunctions at the Royal Herbert Hospital, was recommended "two months' interval," and relapsed eight weeks later; 1 had 42 daily inunctions at the Royal Herbert Hospital and relapsed five weeks later.

(3) The remaining 14 of the 88 cases were treated partly by inunctions and partly by injections, and 11 of these relapsed after receiving an average of 13 daily inunctions and 4 weekly injections.

The 3 cases which did not relapse within four months received treatment as follows during this period: 2 had 40 and 42 inunctions respectively at the Royal Herbert Hospital, a rest of four to six weeks, and then 4 injections; 1 had 12 inunctions in South Africa and then 6 weekly injections.

(*B*) Of the 75 cases which were treated with mercury and observed for six months, 63 relapsed within this period; the treatment of 57 which did so within four months has already been

detailed. The treatment of the remaining 6 cases up to the date of relapse was as follows: 1 had a course of 9 weekly injections, and relapsed at the end of the two months' rest which followed; 1 had 11 weekly injections and relapsed at the end of two months' rest; 1 had 9 weekly injections, two months' rest and 1 injection of the second course; 1 had 9 weekly injections, two months' rest and 2 injections of the second course; 1 had 9 weekly injections, two months' rest and 3 injections of the second course; 1 had 42 daily inunctions at the Royal Herbert Hospital, six weeks' rest and 4 injections of the second course.

Of the 12 cases in this group which did not relapse within six months, 10 received 9 weekly injections, six to eight weeks' rest and a second course consisting of 3 to 6 fortnightly injections; 1 had 6 daily inunctions at the Royal Herbert Hospital and 6 weekly injections in the first course, two months' rest and 4 fortnightly injections of the second course; 1 had 12 daily inunctions, followed by 6 weekly injections in the first course, two months' rest and then 4 fortnightly injections in the second course.

(*C*) Of the 45 cases treated with mercury and observed for nine months, 40 relapsed within six months, and their treatment has already been detailed. Of the remaining 5 cases, 1 relapsed between six and nine months and was treated as follows up to the date of the relapse: 10 weekly injections, six weeks' rest, 6 fortnightly injections and three weeks' rest; the 4 cases in this group which did not relapse at any time during the nine months were treated as follows: 1 had 9 weekly injections, eleven weeks' interval, and then 6 fortnightly injections; 1 had 4 inunctions followed by 6 weekly injections in the first course, two months' rest, 4 fortnightly injections, two months' rest and 1 injection of the third course; 1 had 9 injections in the first course, two months' rest, 6 fortnightly injections in the second course, and then a rest; 1 had 9 weekly injections, five weeks' rest, 6 injections in the second course, and then a rest. It will be recognized, therefore, that in the very great majority of the mercurial cases mercury was given a fair trial.

II. The salvarsan cases were treated as follows: 16 had an initial intra-muscular injection of 0·6 grm; all were under observation for the full nine months, and 2 relapsed within four months; 1 between four and six months and 1 between six and nine months: 6 had a single intravenous injection of 0·5 to 0·6 grm.; all were under observation for nine months, and 2 relapsed within four months; 1 between four and six months and none between six and nine months: 20 had two intravenous injections of 0·4 to

0·6 grm. at intervals of two weeks; all were under observation for nine months, and 2 relapsed between six and nine months: 34 had an initial intravenous injection of 0·5 to 0·6 grm. followed by 3 intravenous of 0·2 to 0·3 grm. at fortnightly intervals. All of these were under observation for at least six months; 9 for at least nine months; 6 for at least eight months; and 12 for at least seven months: 1 relapsed between four and six months and 1 between six and nine months: 12 had an initial intravenous injection of 0·6 grm., 9 weekly injections of mercurial cream (Hg. gr.i in each) and, finally, an intravenous injection of 0·6 grm. salvarsan: 6 of these were under observation for at least six months and 6 for at least five months; none relapsed.

Of the cases which did not relapse, eight were subsequently given an intravenous injection of 0·6 grm. salvarsan on account of the Wassermann reaction being positive. Excepting local treatment to primary sores, this was all the treatment which the respective cases received.

TABLE II.—To Illustrate the Effect of Salvarsan and Mercurial Treatment Respectively in Preventing or Postponing the Occurrence of Secondary Symptoms when Treatment is Commenced in the Primary Stage.

Method of treatment	Total cases under each treatment	Number which subsequently developed secondaries	Per cent. which developed secondaries	Remarks
Salvarsan alone or combined with mercury*	38	2	5·2	*Nine were treated with a combined course of salvarsan and mercury, as mentioned in the text.
Mercury alone	38	36	94·8	

In order to compare the effect of salvarsan with that of mercury in preventing the onset of secondary symptoms when treatment is commenced in the stage of the primary sore we have examined the notes on thirty-eight cases of primary sore which were treated with salvarsan, and compared their behaviour with that of thirty-eight similar cases which were treated with mercury only. The case-sheets of the latter were selected with two stipulations only: (1) that *S. pallidæ* were found in the sore and (2) that treatment commenced before the onset of any secondary signs. In each of the primary sores of the salvarsan series *S. pallidæ* were demonstrated in the sore previously to the commencement of treatment. All the cases were under observation for at least four months, and the minimum period of observation was in one of the two mercurial cases which did not show secondaries. Table II shows the result

of the scrutiny and demonstrates the superiority of salvarsan. It should also be mentioned that one of the two cases which developed secondaries in the salvarsan series first had a recurrence of the primary sore after transfer to another station, and was put on mercurial treatment, receiving a course of nine weekly injections, two months' rest and four fortnightly injections of the second course up to the date of onset of his secondary symptoms, which occurred twenty-five weeks after the sore returned; so that, strictly speaking, this is a case where mercury failed to prevent secondary signs.

The treatment of the mercurial cases was as follows: Of those which did not show secondaries, one had 9 weekly injections, a rest of two months, 3 injections of the second course and then passed to the Army Reserve; one had 10 weekly injections, 7 weeks' rest, 6 further injections, three months' rest, 4 more injections and then went to the Reserve; the remaining 36 cases which developed secondary symptoms did so as follows:—

4	after the	1st	injection	2	after the	6th	injection
2	,, ,,	2nd	,,	1	,, ,,	7th	,,
4	,, ,,	3rd	,,	3	,, ,,	8th	,,
2	,, ,,	4th	,,	13	,, ,,	9th	,,
1	,, ,,	5th	,,	3	,, ,,	10th	,,
				1	,, ,,	11th	,,

The 3 cases which developed secondaries after the tenth injection had received 9 injections in the first course, then two months' rest, and the symptoms were noted immediately before the second injection in the second course. The last case had 11 injections in the first course. In no case did the first course consist of less than 9 injections. All were treated at Rochester Row.

The salvarsan cases were treated as follows: Of those which developed secondaries, 1 had an intramuscular injection of 0·6 grm., the sore recurred one month later, and he was put on mercurial injections as already detailed; secondary symptoms occurred twenty-five weeks later.

One had 2 intravenous injections of 0·4 and 0·5 grm. at an interval of two weeks and developed secondaries thirty-four weeks later.

Of those which did not develop secondaries, 3 had an intramuscular injection of 0·6 grm., and 1 of these was given an intravenous injection of 0·6 grm. for a positive Wassermann reaction twenty-six weeks later; all were under observation for at least nine months: 2 had an intravenous injection of 0·6 grm. and were under observation for at least nine months; 5 had 2

intravenous injections of 0·4 and 0·5 grm. at two weeks' interval, and all were under observation for at least nine months; 17 had an initial intravenous injection of 0·6 grm. followed by three intravenous injections of 0·2 to 0·3 grm. at fortnightly intervals; 6 of these were under observation for at least nine months; 3 for at least eight months; 6 for at least seven months; and 2 for at least six months; 9 had an initial intravenous injection of 0·6 grm., nine weekly injections of mercurial cream and, finally, an intravenous injection of 0·6 grm. salvarsan; 3 of these were under observation for at least six months; 4 for at least five months; and 2 for at least four months.

TABLE III.—To Illustrate the Effect of Mercurial Injections on the Wassermann Reaction in Syphilis.

Tested at end of	Original Method				Stern's Modification			
	Total cases	Positive	Negative	Per cent. positive	Total cases	Positive	Negative	Per cent. positive
1st course of 6-9 injections	89	66	23	74·1	39	32	7	82·0
1st interval of 6-8 weeks	21	15	6	71·4	14	11	3	78·5
2nd course of 4-6 injections	80	43	37	53·7	36	27	9	75·0
2nd interval of 2-3 months	27	19	8	70·3	24	23	1	91·6
3rd course of 4 injections	80	42	38	52·5	46	35	11	76·0
3rd interval of 2-3 months	34	18	16	52·9	24	18	6	75·0
4th course of 4 injections	121	43	78	35·5	90	53	37	58·8
4th interval of 4-6 months	41	24	17	58·5	27	17	10	62·9
5th course of 4 injections	65	23	42	35·3	45	28	17	62·2
5th interval of 4 weeks	60	16	44	25·1	44	26	18	59·0
6th or 7th course of 4 injections	105	39	66	37·1	71	47	24	66·1
Three months after end of usual period of treatment	170	67	103	39·4	105	80	25	76·1

The behaviour of the Wassermann reaction under mercurial and salvarsan treatment respectively is shown in Tables III and IV. No case is included in Table IV which received any treatment previously to the administration of salvarsan.

TABLE IV.—TO ILLUSTRATE THE EFFECT OF SALVARSAN ON THE WASSERMANN REACTION IN SYPHILIS, THE PATIENTS HAVING RECEIVED NO PREVIOUS TREATMENT.

Tested at the end of	Original method				Stern's modification			
	Total cases	Positive	Negative	Per cent. positive	Total cases	Positive	Negative	Per cent. positive
3-4 months..	76	12	64	15·7	65	18	47	27·6
6 months ..	58	16	42	27·5	48	20	28	41·6
9 months ..	28	10	18	35·7	21	11	10	52·3

The great majority of the mercurial cases had received nine injections in the first course, so that the end of the first rest corresponds to three or four months from the commencement of treatment, six months with the end of the second course, and nine months with about the middle of the third course. The tables illustrate the more intense effect of salvarsan and show that the clinical results do not represent a mere cloaking of symptoms. At the same time we are quite alive to the fact that an important percentage of the salvarsan cases remained uncured at the end of three, six and nine months respectively. Though this may be accounted for to a certain extent by the fact that Table IV includes a number of cases treated by intramuscular injection, and we believe that better results will be shown by those treated on later plans, the percentage of positive reactions remaining at the end of the periods stated shows the necessity of including the Wassermann test in the subsequent observation of cases treated with salvarsan. The same remark applies equally to cases which are treated with mercury; in this connection, we would draw attention to the results which were obtained by the Wassermann test three months after the termination of the usual two years' mercurial treatment, averaging twenty-eight injections, and would take this opportunity of urging that when patients are treated with mercury alone the treatment should be more intense, especially in the early stages. Our plan is, at present, to arrange for cases which are treated with mercury alone to have at least forty injections in two years.

Regarding the actual administration of salvarsan, as we mentioned in a previous paper, we have discarded the subcutaneous and

intramuscular methods in favour of the intravenous. The sole disadvantage of the latter method is the reaction which sometimes follows the injection in a few hours, and we have tried many plans of eliminating this. It was at first attributed to the salvarsan, till we remembered that similar reactions may follow the intravenous infusion of plain saline. After varying the salt content of the infusion without success, we noticed Wechselmann's suggestion that the reaction was due to micro-organisms in the salt solution and distilled water. At first sight, this would appear to have little foundation, seeing that we always autoclaved our solutions at 130° C. for at least twenty minutes previously to using them for solution of the salvarsan. Wechselmann pointed out, however, that when the salt solution and distilled water have been prepared for some days micro-organisms grow in them and that injection of their dead bodies is sufficient to provoke the reaction. Acting on this, we commenced to make a practice of preparing the salt solution on the same morning as the injection, autoclaving it immediately after preparation, as we judged that bacteria would be more likely to grow in normal saline than in distilled water. Subsequently we began to distil the water on the same morning as the injection and still later we took Merck's purest sodium chloride into use. The results of these successive changes were as follows: Of 32 consecutive cases injected previously to introducing the changes mentioned, 8 had a rigor; 26 had a temperature of 100° F. or over; 17 vomited. When the salt solution was prepared on the morning of injection, of 35 consecutive cases, none had a rigor; 15 had a temperature of 100° F. or over; 9 vomited slightly. When, in addition, the water was distilled on the morning of injection, of 25 consecutive cases, none had a rigor; 6 had a temperature of 100° F. or over; 3 vomited a little and 2 had slight diarrhœa. When Merck's sodium chloride was taken into use, in addition to the above, of 35 consecutive cases, 1 had a rigor; 10 had a temperature of 100° F. or over; 4 vomited slightly and 3 had mild diarrhœa.

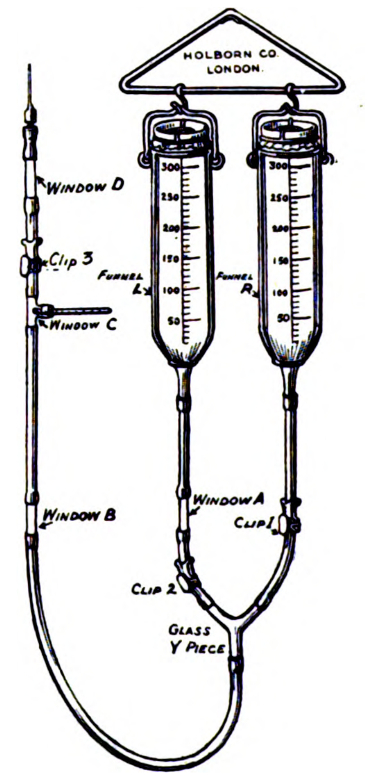
From this it is apparent that the preparation of the salt solution on the morning of injection had the greatest effect in reducing the number and severity of the reactions and that this was still further enhanced by the fresh distillation of the water, but that the use of Merck's sodium chloride had no advantage over that supplied as pure by the contractors. The patients, being in bed, do not notice a transient temperature below 102° F., so that subjective symptoms have been very mild since the changes were introduced.

It is not a matter of great difficulty to prepare the salt solution freshly, but we can easily understand that in hospitals not provided with a still which works rapidly it may not be easy to prepare the distilled water on the same morning. In these cases we would suggest that the water be distilled into Erlenmeyer flasks, which have been thoroughly cleansed previously, that the water be sterilized at once in the autoclave or steamer, or by boiling it for at least half an hour, and that then the neck of the flask be closed with a sterile rubber bung and tied over with sterile lint. When the only means of sterilizing the salt solution is by boiling it for thirty minutes, it is necessary to remember that this process concentrates the solution, and its volume must be made up to the original with sterile distilled water afterwards. The upper level of the solution should be marked on the outside of the flask; therefore, before the solution is boiled, and this can be done more accurately on an Erlenmeyer than an ordinary spherical flask.

We have modified the apparatus described in this Journal of April, 1910, in a few respects and its present form is shown in the illustration. The glass Y-piece, at which the two rubber tubes (conveying salt solution and salvarsan respectively) meet, has been placed much nearer to the two funnels. Each of the latter has been fitted with a detachable strainer, which consists of two wire rings, a larger one above to fit outside the rim of the funnel and a smaller one below to fit inside it, the two rings being joined by wire stays. A piece of fine muslin is placed over the mouth of the funnel, and the wire frame then pressed into position, as shown in the illustration. The funnels are sterilized with the strainers in position, so there is no handling of strainer cloth afterwards. A thermometer to register the temperature of the solution just before it reaches the vein has also been introduced at window C. The latter is a glass T-piece, the stem of which is fitted with a perforated rubber bung through which the bulb of the thermometer is thrust. The thermometer should be kept in 1 in 1,000 perchloride of mercury when not in use and washed free of the chemical under a hot water tap immediately before being inserted in the T-piece.

To use the apparatus as it is now arranged, some salt solution is poured into both funnels, clips 1 and 2 being closed and clip 3 open. The tubing is then held by the needle end as high as possible above the level of the salt solution, and clips 1 and 2 opened. It is then slowly lowered till salt solution begins to flow from the needle end. Clip 1 is then closed, but clip 2 left open

till the solution in funnel L (which is intended for salvarsan) has nearly reached the bottom of the funnel. The needle should be fitted while the solution is flowing. Clips 2 and 3 are then closed and clip 1 opened. The dose of salvarsan solution is poured into funnel L, and enough salt solution into funnel R to reach the 100 cc. mark or over. The funnels are raised to a height of 4 ft.



above the level of the operating table, and all slack tubing coiled into a bowl containing water at about 120° F. Clip 3 should then be opened and the thermometer watched. The mercury will probably fluctuate rather widely at first, but will presently become steady at about 100° F. Clip 3 is then closed, and all is ready for the operation. When the needle has been introduced into the vein clip 3 is opened, and the solution in funnel R watched to see that it is flowing satisfactorily. As soon as this has been ascertained,

and it is seen that no swelling has formed round the vein, clip 1 is closed and clip 2 opened, and the salvarsan solution will flow steadily into the vein. It will be noticed that we do not now wait for blood to appear at the first glass window, but rely on the salt solution flowing satisfactorily, and the absence of any swelling round the vein, as indications that the needle has been properly introduced. In fact, we raise the funnels well above the operating table from the commencement in order to prevent blood from flowing back into the tubing. The blood gives no more information and might block the needle. It is easy to regulate the temperature of the solution during the administration by adding hotter water to that in the bowl in which the tubing is coiled, or removing some of the tubing from the hot water, according to whether the level of the mercury in the thermometer falls below or rises above 100° F. When the last of the salvarsan solution has passed clip 2 and just appears at the glass Y-piece, clip 2 is closed and clip 1 again opened. Salt solution is thus allowed to flow from funnel R till it has replaced the yellow salvarsan solution in window D. The needle is then withdrawn. The patient should rest in bed and be kept on a light diet till noon the following day.

We suggest the following scheme of treating syphilis with salvarsan from the commencement with the full consciousness that it may require some modification when sufficient time has elapsed to allow us to judge of its imperfections rather more fully than at present. We are well aware that some other workers, notably Gennerich, recommend a much more strenuous treatment, but while we aim at achieving the highest possible percentage of cures we desire to do so by the simplest method which is compatible with that end. So far we have obtained the most satisfactory results with the scheme of management which we are now advocating, and, as the great majority of Army cases are constantly under careful supervision, a scheme on more strenuous lines can be introduced later if the suggested scheme be found eventually to be insufficient, without any harm having happened to the patients. We therefore recommend the following:—

(1) No effort should be spared to make the diagnosis as early as possible. This is particularly important in the primary stage, and we cannot emphasize too strongly the importance of searching for the *Spirochæta pallida*, which can be found and the diagnosis established long before the sore is indurated. In fact, when induration has occurred our experience shows that the Wassermann reaction has already become positive in the great majority of cases,

and valuable time has been lost. The primary sore should be treated with vigorous local measures, excision when possible, and the use of the thermo-cautery or 30 per cent. calomel ointment in other cases.

(2) An injection of salvarsan should be given intravenously with the least delay, and the dose should be the largest which the patient is likely to stand. Almost every soldier can be given 0·6 grm. without fear. Some workers recommend that previously to the administration of salvarsan a course of mercury should be given. Considering the immensely superior effect of salvarsan in arresting the activity of the *S. pallida*, we can see no reason for such a course. In fact, we hold very strongly that the first remedy to administer should be the one which will at once deliver the most crushing blow to the parasite.

(3) For reasons we have mentioned above, it is always desirable to follow up the salvarsan with mercury, either in the form of intramuscular injection or *efficient* inunction. If the former be preferred the course should consist of nine weekly injections (Hg. gr. i in each), or three of calomel cream (Hg_2Cl_2 gr. $\frac{3}{4}$ in each) and six of mercurial cream.

(4) On completion of the course of mercury it is advisable to administer another injection of salvarsan, giving the same dose intravenously as in the first instance.

It is difficult at this stage to recommend a definite procedure as to subsequent observation. On the one hand, we have shown above by the fact that relapses occur in a certain proportion of cases and, in more instances, the Wassermann reaction remains positive, that not all cases treated by salvarsan are cured at once, so that it will certainly be necessary to keep patients under observation after completion of this combined course. On the other hand, we think that this observation need not require the patient's attendance so frequently as under treatment by mercury alone. In order to arrive at some conclusion as to the length of time it may be safe to excuse the patient's attendance for examination immediately after the completion of the combined course, we have examined the histories of 81 cases which had previously received no treatment whatever and were observed for three months after the last injection of salvarsan in the initial course, as detailed below, to ascertain the number which relapsed in this time. Of the 81 cases, 15 received an intramuscular injection of 0·6 grm.; 6 received an intravenous injection of 0·5-0·6 grm.; 20 received two intraveneous injections of 0·4-0·6 grm.; 34 received an intravenous injection of 0·5-0·6 grm., followed by 3

of 0·2-0·3 grm. at fortnightly intervals, and 6 received the combined course outlined above.

Three of the above cases relapsed within the three months: one after a single intramuscular injection and two after a single intravenous injection. In two of the relapses it was the primary sore which returned. On the strength of this, we think that it would be safe to excuse the patient further attendance for three months after completion of the combined course we recommend, particularly if he is told to report sick in the event of any recurrence of active signs. At the end of the three months it is highly important that the blood should be examined for the Wassermann reaction, and this blood examination should be repeated at three monthly intervals for the remainder of the two years from the date of first injection. If on this or any subsequent occasion the Wassermann reaction should be positive, the treatment should be repeated at once. Though a positive reaction does not always mean an imminent clinical relapse, yet in a high proportion of cases which relapse clinically the Wassermann reaction becomes positive some weeks previously, and, if we may judge from the effect of repeating the injection in cases which do relapse, there is good reason to believe that a repetition of the treatment as soon as the Wassermann reaction has been noted as positive will have the effect of averting a large number of clinical relapses. Apart, however, from the advantage of saving a certain amount of inefficiency through residence in hospital for relapses, our object must always be to obtain a permanent cure, and it is reasonable to suppose that this end will be more easily attained if we attack the parasite when it is only sufficiently active to provoke a Wassermann reaction, rather than wait till it has revived sufficiently to call forth outward signs of syphilis.

Regarding the intervals which should elapse between clinical examinations of the patient, we think that attendance every four weeks after the three months has elapsed from the completion of the combined course should be sufficient if the blood is examined as we have recommended. It must be remembered that this scheme applies only to cases which are treated from the first with salvarsan, not to those in which this remedy is given after a more or less extended trial of mercury; the latter would include a number of intractable cases of older standing, and such, being more prone to relapse, should be observed more frequently.

In view of the somewhat alarming reports which some authors have made on the occurrence of disorders of the nervous system

following the use of salvarsan, it is necessary that we should add our own experience in this matter. In one only of all our cases has any affection of the nervous system followed the administration of salvarsan, when no previous disease of the nervous system existed. In this case the patient was admitted for secondary ulceration of the tonsils, which had not yielded to calomel and mercurial cream injections, the primary sore having occurred twelve months previously. He was given an initial dose of 0·6 grm. salvarsan, followed by three intravenous injections of 0·2 grm. at fortnightly intervals. The throat healed promptly, but he developed symptoms of spinal meningitis two months after the last injection. These increased till he was re-admitted to hospital one month later. On re-admission he was also suffering from gonorrhœa. He recovered sufficiently to return to duty a month after this, but the symptoms subsequently returned, and he was eventually invalided three months later. There seems to us no more reason for attributing to salvarsan the symptoms which this patient developed subsequently to the injection, than for ascribing to the effect of mercury the ten cases of disease of the nervous system, excluding parasyphilis, which developed under mercurial treatment and were eventually treated by us with salvarsan. In these cases, complete relief resulted in six, and marked benefit in the remaining four. Finger states that 4 per cent of primary cases, 12 per cent of secondary, and 2 per cent of tertiary cases, which are treated with salvarsan subsequently develop affections of the nervous system in from two to eight months, and criticizes the published statistics on this subject, on the grounds of insufficient subsequent observation. We have treated 392 patients with salvarsan, including 66 primary, 281 secondary, 38 tertiary, and 7 parasyphilitic, and of all these,

216	have been	under observation	for at least	4	months
190	,,	,,	,,	5	,,
166	,,	,,	,,	6	,,
142	,,	,,	,,	7	,,
114	,,	,,	,,	8	,,
94	,,	,,	,,	9	,,
66	,,	,,	,,	19	,,
49	,,	,,	,,	11	,,
35	,,	,,	,,	12	,,
19	,,	,,	,,	13	,,
11	,,	,,	,,	14	,,

176 having been observed for less than four months since the date

of the first injection; so that insufficient observation does not account for the freedom of our patients from these nervous affections. As regards the question of disasters immediately following the injection, we can only say that in 43 intramuscular and 791 intravenous injections administered up to the present date (December 6, 1911), we have had no death, and in one case only, a very early one, has any local trouble followed an intravenous injection. In this case some of the salvarsan solution had been inadvertently injected into the tissues on the deep side of the vein, and the arm was swollen for ten days afterwards. At the same time it is necessary to remark that in administering salvarsan intravenously it is essential that every detail of technique should be strictly observed. The fact that there is nothing in the technique which is beyond the capacity of anyone with ordinary skill and intelligence does not make salvarsan a remedy which can be administered carelessly with impunity.

AN OUTBREAK OF PARATYPHOID B FEVER IN MALTA.

By Major M. H. BABINGTON.
Royal Army Medical Corps.

Towards the end of August, 1910, there was a sudden outbreak of fever in the 1st Battalion Suffolk Regiment. The outbreak was preceded by a few isolated cases earlier in the year. The first case was admitted to hospital on May 29, 1910, from St. Andrew's Barracks. He was discharged to his barracks on July 25, 1910, his excreta having been examined and found free from infection. Sixteen days after this patient's discharge, Private L., the second case, felt ill. The intervals in days between the return of the first case to barracks, and the onset of the disease in the succeeding cases, i.e., the second to the fourteenth in the series, were as follows: 16, 25, 29, 30, 31, 32, 32, 31, 33, 33, 34, 36, 51. All the cases but one came from the Suffolk Regiment occupying St. Andrew's Barracks, the exception was Case No. 11, who belonged to the King's Royal Rifle Corps living in the adjoining St. George's Barracks.

The table below shows the cases in the order in which they were admitted to hospital. The temperature charts are those of some of the cases in which the bacillus was found in the blood. The number on the temperature chart refers to the number of the case in the table.

Clinical Notes on the Cases.

Case No 1.—Private D. resembled an ordinary mild enteric. Blood culture 5 c.c. in ox bile remained permanently sterile. There was no diarrhœa. Epistaxis was noticed on the fifth and eighteenth days. Convalescence was protracted by a weak and rapid heart.

Case No. 2.—Private L. felt remarkably well during the attack, the only symptom being headache during the first few days. For four days the pyrexia was continuous. For the remaining eighteen days temperature was intermittent, never rising much above 101° F.

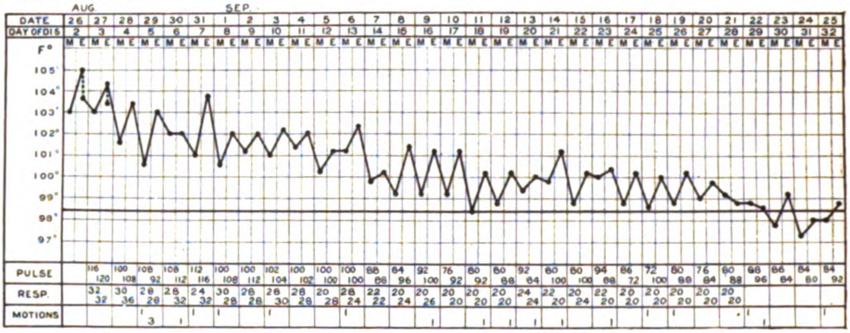
Case No 3.—Private F., practically the only symptoms were slight headache and malaise. The temperature seldom exceeded 100° F., and was intermittent throughout.

No.	Rank	Name	Corps	Quarters	Onset	Admitted	Discharged	Duration of pyrexia in days	Result of blood culture	Serum reactions	
										Para. B	B. typhosus
1	Pte.	D. ..	Suffolk Regt. ..	St. Andrew's	4.5.10	6.5.10	25.7.10	23	Sterile	+ 1-80	+ 1-20
2	,,	L. ..	,, ..	,, ..	10.8.10	12.8.10	29.9.10	22	None taken ..	+ 1-2560	− 1-20
3	,,	F. ..	,, ..	,, ..	19.8.10	20.8.10	27.9.10	16	,, ..	+ 1-1280	− 1-20
4	,,	G. ..	—	—	23.8.10	24.8.10	28.9.10	12	,, ..	+ 1-320	− 1-20
5	Cpl.	B. ..	,, ..	St. Andrew's : 1 Room, D Block	24.8.10	27.8.10	7.10.10	20	Para. B grown	+ 1-640	± 1-20
6	Pte.	K. ..	,, ..	St. Andrew's	25.8.10	27.8.10	4.10.10	9	Sterile	+ 1-320	− 1-20
7	,,	N. ..	,, ..	St. Andrew's : 2 Room, C Block	26.8.10	27.8.10	16.11.10	30	Para. B grown	+ 1-160	± 1-20
8	,,	T. ..	,, ..	St. Andrew's : 3 Room, C Block	26.8.10	27.8.10	9.9.10 (Died)	16	,, ,,	+ 1-320	± 1-20
9	Sgt.	S. ..	,, ..	St. Andrew's : Bunk, 3 Room, C Block	25.8.10	29.8.10	28.9.10	16	,, ,,	± 1-40	− 1-20
10	Pte.	H. ..	,, ..	St. Andrew's : 2 Room, A Block	27.8.10	27.8.10	12.10.10	18	,, ,,	+ 1-1280	± 1-20
11	,,	T. ..	K.R.R ..	St. George's	27.8.10	27.8.10	28.9.10	5	None taken ..	+ 1-160	− 1-20
12	Cpl.	A. ..	Suffolk Regt. ..	St. Andrew's : I Block	28.8.10	29.8.10	4.10.10	12	Para. B grown	+ 1-640	± 1-20
13	,,	G. ..	,, ..	,, ...	30.8.10	30.8.10	20.9.10	4	None taken ..	+ 1-320	− 1-20
14	,,	C. ..	,, ..	St. Andrew's : 3 Room, H Block	14.9.10	14.9.10	12.10.10	6	Para. B grown	—	—

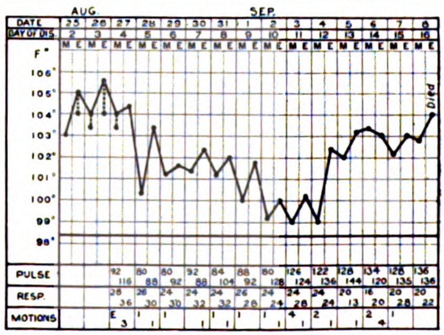
Case No. 4.—Private P. was similar to No. 3.

Case No. 5.—Corporal B. admitted on the fourth day of his disease with a herpetic eruption on the right side of his mouth. He suffered from persistent headache for some days, otherwise no special symptoms.

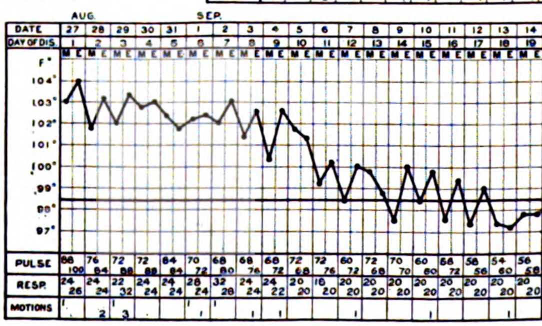
CASE No. 7.



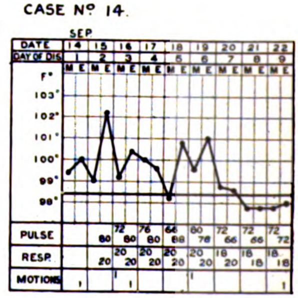
CASE No. 8.



CASE No. 10.



CASE No. 14.



Case No. 6.—Private K. Temperature 102·8° F. on admission. Had been ill for three days before coming to hospital. Had irregular intermittent fever for nine days. The only symptoms were headache, retention of urine, and pain over liver.

Case No. 7.—Private N. after admission became rapidly delirious and semi-conscious. Abdomen distended, and face cyanosed. Began to improve on sixth day. A very profuse rash appeared on eighth day. Thrombosis of long saphenous vein supervened on the twenty-second day. The rash was composed of spots resembling enteric spots. See chart, Case No. 7.

Case No. 8.—Private T. became delirious on the seventh day of his illness. Hæmorrhage from the bowel occurred on the eighth, tenth and twelfth days. The hæmorrhage on the twelfth day was very profuse, leaving the patient almost pulseless, and necessitating the use of subcutaneous saline infusions. This was the only fatal case. See post-mortem report and temperature chart, Case No. 8.

Case No. 9.—Serjeant S., a mild case. Rash, which was scanty, appeared on the sixth day and resembled a typical enteric rash, After the first few days patient had no symptoms.

Case No. 10.—Private H., a moderately severe case admitted on the first day of the disease. Felt perfectly fit on the day before admission. Suffered from severe pain in the muscles of the back on the fifth, sixth and seventh days. Had epistaxis on the first and tenth days. Numerous rose spots on abdomen. See temperature chart, Case No. 10.

Case No. 11.—Private T.; this was the only case not belonging to the Suffolk Regiment. The diagnosis was based on the serum reaction, and on the recovery of the bacillus paratyphosus B in the fæces. A very mild case. Pyrexia, remittent in type, lasted only five days.

Case No. 12.—Corporal A., diarrhœa on admission, afterwards retching and vomiting. Very numerous rose spots appeared on the third day of the disease. A mild case.

Case No. 13.—Private G., the mildest case in the series. Admitted on the first day of his disease with a temperature of 102° F. On the three following days temperature rose to just over 99° F. Only symptoms were thirst and slight abdominal pains. Serum on the third day of the disease in a 1 in 10 dilution was negative to the paratyphoid strain isolated from Case No. 10; but on the ninth day, i.e., five days after his temperature had become normal, the serum in a dilution of 1 in 320 completely agglutinated the same strain.

Case No. 14.—Private C., practically the only symptoms were pyrexia and epistaxis. See temperature chart, Case No. 14.

Diagnosis.

In seven cases the diagnosis was made on the result of the blood culture. In the remaining cases the diagnosis was based on

the serum reactions. (See Table.) The strain of paratyphoid B bacillus used for this purpose was that isolated from Case No. 10. This strain proved to be quite reliable for this purpose. Normal serums in a dilution of 1 in 10 failed to cause any agglutination with emulsions of this bacillus, and serum in a 1 in 20 dilution from undoubted cases of enteric fever caused only incomplete agglutination. Since this epidemic I have put up numerous samples of serum with emulsions of this bacillus but have never found one to agglutinate it. For statistical purposes only the seven cases from whose blood the bacillus was isolated were returned as paratyphoid B fever.

Post-mortem Notes.

Extract from post-mortem report of Case No. 8. "The mucous membrane of the duodenum and jejunum appears healthy, but in the ileum the intestinal wall is thin and atrophied. Peyer's patches are very distinct but show no signs of inflammation or of ulceration. The large intestine is intensely inflamed throughout its whole length. The mucosa is deep red in colour and studded thickly from the ileocæcal valve to the anus with innumerable ulcers varying in size from a pinhead to a sixpence. The ulcers are largest in the cæcum and the necrosis is here very deep, extending to the peritoneum. The mucosa of the cæcum is almost completely destroyed by ulceration, what remains is of a greenish colour and appears to be gangrenous."

Details as to Previous Inoculation against Enteric Fever.

Case No. 5.—Received the following doses of antityphoid vaccine.

November 7, 1907, 0·45 c.c.; November 22, 1907, 1·0 c.c.; March 29, 1910, 0·5 c.c.; April 16, 1910, 1·0 c.c.

Case No. 7.—Was inoculated with only one dose at Woolwich, in 1907.

Case No. 8.—A fatal case. Had not been inoculated against enteric.

Case No. 9.—Had not been inoculated against enteric.

Case No. 10.—Inoculated in February, 1910, receiving two injections.

Case No. 12.—Had not been inoculated.

Case No. 14.—Received one injection at Woolwich, 1907, also one injection at Malta, 1909.

Cause of the Outbreak.

As the cases came from a considerable distance I was unable to investigate the epidemic on the spot. The regiment had a good sanitary reputation, in fact, in attention to sanitary detail it was considered second to none on the island. It will be noted that the first case occurred in May, and that there were no other cases until after the first had returned to barracks. This first case was a married man living in quarters; on his return to barracks he was in no way concerned in the preparation of food; so that it is difficult to imagine in what manner he could be responsible for the outbreak. A spot map showed that the cases came from no particular room or block of buildings. The fruit contractor to the regiment was discovered to have his fruit stored outside of barracks in a very filthy room, in which he also kept pigs. This was considered to be the source of infection from which the disease originated. Many of the patients, however, did not eat this fruit. Several of them stated that they had never eaten fruit in Malta. The fruit therefore could not have been an important factor in disseminating the disease. The barracks have a water-carriage system of sewage disposal. The water supply is that known as the Wigancourt and was being used without bad effects by several units, moreover for six months before the outbreak all drinking-water had been boiled.

Bacteriology.

Blood cultures were made from nine of the cases. From seven of these the paratyphoid B bacillus was isolated—two of the cultures remained permanently sterile. The method employed in the majority of the cases was as follows: 10 c.c. of blood was withdrawn by means of an antitoxin syringe from a vein at the bend of the elbow, and introduced into four test-tubes, each containing 12 c.c. sterile ox bile. One cubic centimetre of the blood was put in the first tube, 2 c.c. in the second, 3 c.c. in the third, and 4 c.c. in the fourth. After about sixteen hours at 37° C., agar slopes were inoculated. Hanging-drops made about six hours later from the agar slopes showed numerous bacilli when the blood culture was successful. In two cases the method of adding $2\frac{1}{2}$ c.c. of blood to 250 c.c. of sterile water was tried, and in both cases successful results were obtained, but more time was required than with samples of the same blood in ox bile.

The biochemical reactions of each culture were then examined, and a diagnosis made. By this means it was possible to say thirty-four hours after making a blood culture that the cases were not

enteric, and at the end of three days, when the litmus milk had become definitely alkaline, the cases were diagnosed paratyphoid B fever.

In October, 1910, Major W. S. Harrison wished to examine the culture isolated from the blood of the fatal case. I was fortunately able to accede to his request for a sub-culture. This he examined, and found it to be paratyphoid B. All the cultures but one which was being frequently sub-cultured for use in the laboratory gradually died out. This one was obtained from Case No. 10 in the series, and has been sub-cultured on agar at intervals of a month since it was first isolated.

After reading the articles which have appeared recently in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, I thought it advisable to have an unbiassed opinion on this bacillus. I therefore sent a culture of this organism, isolated from Private H., Case No. 10, to the Royal Army Medical College, giving no information as to its source, and requesting that I might be informed whether it was paratyphoid A or B. This investigation was carried out by Major S. L. Cummins, whose report I append.

"REPORT BY MAJOR S. L. CUMMINS ON CULTURE SENT BY MAJOR BABINGTON FROM MALTA—SOURCE NOT STATED.

"*Morphology.*—Short motile bacillus; negative to 'Gram.'

"*Cultural Characters.*—Forms acid and gas in glucose, mannite, maltose, and dulcite; no change in lactose, cane sugar, salicin, and inulin. Litmus milk, in twenty-four hours, slightly acid; in three days, alkaline. Indol *nil*, or slight trace in nine days.

"*Agglutination.*—Unaffected by paratyphoid A serum (Lister); agglutination complete to $\frac{1}{200}$ (one hour), with antityphoid serum (Burroughs, Wellcome and Co.).

"*Absorption.*—It removes from a typhoid serum the group agglutinins affecting paratyphoid B; and paratyphoid B removes from a typhoid serum the agglutinins affecting the 'No. 10' strain.

"*Further Tests.*—(1) A rabbit immunized against the 'No. 10' strain developed agglutinins for both 'No. 10' and paratyphoid B.

"(2) A rabbit immunized against paratyphoid B, agglutinated both paratyphoid B and the 'No. 10' bacillus.

"(3) The 'No. 10' strain absorbed all agglutinins both for Paratyphoid B and the 'No. 10' strain.

"(4) Paratyphoid B absorbed all agglutinins both for 'No. 10' bacillus and paratyphoid B.

"Tests '3' and '4' were carried out with both sera.

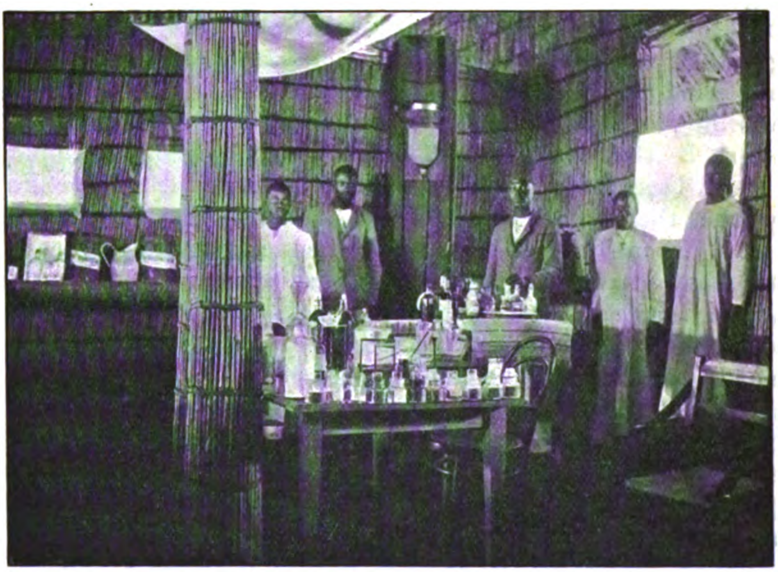
"There is no doubt that 'No. 10' strain is a true paratyphoid B."

NOTES ON THE TREATMENT OF SYPHILIS IN UGANDA.

By Captain G. J. KEANE.
Royal Army Medical Corps.

In March, 1910, Government proposed establishing a centre for the treatment of venereal diseases at Masaka on account of their prevalence in this district. The County Chief was called upon to build this hospital and huts for the reception of sick. This he did at his own expense, and expressed great pleasure at the proposed measures for checking the spread of these diseases among his people. Accommodation is now provided for the reception of 300 patients, and food supplied free by the chiefs. As the food is almost as plentiful as grass and of little more market value, this is not a difficult matter. The sick are sent in by the chiefs for treatment. The idea of its being necessary to have the sick brought in may at first sight seem curious. These diseases are extremely common, and the majority of the infected seem to regard the disease very much as children's epidemics used to be regarded in the less enlightened days at home, an inevitable something which had to be endured. It never seems to occur to these people to seek treatment of their own accord; they remain festering in their villages, infecting other adults and children, until they are referred here for treatment by their chiefs. Once arrived they are willing enough to undergo treatment, and often show great interest in their progress. Though no compulsion is employed to retain them here, and they are free to take their departure at any time, they almost invariably remain until they are free from signs. The majority of cases are in the secondary stage of syphilis when they arrive. Owing to ignorance presumably the primary stage of the disease is rarely recognized. The disease seems to find its chief expression in the secondary stage. Tertiary syphilis seems to be relatively uncommon. When it does occur the manifestations are simple and unimportant, mainly cutaneous affections—psoriasis, chronic ulcerations, &c. The severe lesions of the nervous system, so common in Europe, and which make syphilis so dreaded a disease there, are rarely seen in these people. This fact may partly explain the light view taken of syphilis by the native. I believe the opinion is held by some syphilologists that if the secondaries come out well the liability to tertiary

Hospital Huts.



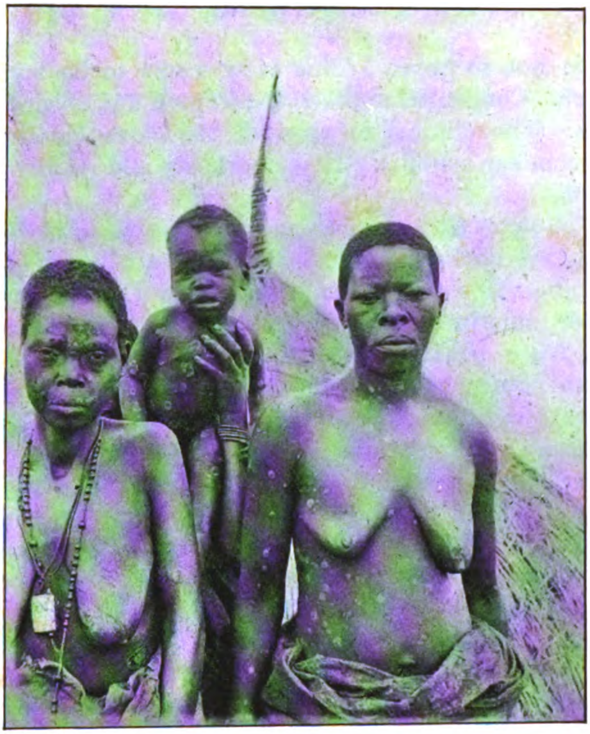
Interior of Treatment Room and Native Assistants.

symptoms is not so great. This view seems to be borne out in practice here. Congenital syphilis is common and assumes a rather severe type. The clinical features of the cases closely resemble those of secondary syphilis. It is markedly and readily responsive to treatment.

Clinical Signs of Secondary Syphilis.—The clinical features of the cases are almost always identical, though the severity of the signs varies in different individuals. These are (1) the rash, always well-marked, sometimes dry and corresponding with that seen in Europeans, more usually pustular. In severe cases the body is covered with pouting, cauliflower-like excrescences, fetid and discharging; (2) throat affections, mucous patches on the fauces, often a spongy mass of granulations is seen extending down behind the molar teeth; ulcerations of the mucous membrane of the hard and soft palate; (3) arthritic and osteal affections, pain is most commonly complained of in the sternum and the ribs, arthritic effusions appear most usually in the knee-joints; (4) mouth, well-marked condylomata are seen at the angles of the mouth and along the mucous membrane of the cheeks at the points of contact with the teeth; (5) condylomata are seen at all the flexures; they are especially common in the axillæ, so much so that the occurrence of flat circular ulcers in the axillæ are absolutely diagnostic. The region between the coccyx and the pubis is almost invariably occupied by heaped up masses of sloughing granulations. The accompanying photographs represent the common and every-day type of case.

Treatment.—Complete treatment as we know it, namely twenty-one months, is inexpedient in this country and as will be seen later it is questionable how far it can be said to be necessary from a medical standpoint.

The method of treatment employed in all adult cases is intramuscular injection of Lambkin's mercurial cream. Six injections are administered at intervals of seven days, then follows a rest period of four weeks, then a further four injections at weekly intervals. After this should any sign persist, treatment is carried on with four injections at intervals of a week followed by a month's rest and so on for as long as is necessary. All patients are encouraged to attend as long as possible even if not receiving injections, in order that observations may be made as to progress or recurrence. The average duration of treatment here is fourteen weeks. Congenital syphilis cases are treated by abdominal inunctions of 10 per cent ung. hydrarg. The application to chronic



(A) Secondary and Congenital Syphilis before Treatment.

(B) Same as (A) after Treatment.

tertiary ulcers of Lambkin's calomel cream, thinly smeared on lint, gives remarkable results.

Dosage.—A uniform dose of $\frac{1}{5}$ gr. is given in all cases. Higher doses, as will be shown, are as unjustifiable as they are uncalled for. Salivation is the only notable result. I have six case sheets showing administration of initial doses of $\frac{1}{2}$ gr. followed by five doses of $\frac{1}{5}$ gr. Five of these cases showed marked salivation later.

Results.—The case sheets show that response to this treatment is marked and immediate. Not uncommonly, even in severe cases, all signs have disappeared by the time the first course of six injections is completed. At the conclusion of the second course, if signs have not returned meanwhile and are then absent, I discharge patients, instructing them to attend from time to time for observation. I have numerous records of such cases, and my experience here is that the signs do not as a rule return. I have been engaged for the greater part of three years in the treatment of syphilis in these people and have had opportunities of observing cases continuously for fifteen months. I have records of cases of severe secondary syphilis where the subjects only attended for six injections, on completing which they were free from all signs of the disease and have since to my certain knowledge shown no further symptoms. This result is at variance with recognized views and may be a special feature of this disease in these people. Its obvious bearing on the practical problem of the suppression of the disease here is of immense importance, for such persons are incapable of propagating acquired syphilis, and are presumably immune from re-infection. They may become the subject of tertiary syphilis, but that is a personal matter and not of public concern.

The prevention of congenital syphilis is indirectly ensured inasmuch and in so much as the spread of acquired syphilis is militated against, the occurrence of congenital syphilis in the offspring of tainted parents is not entirely precluded. But, then, as was pointed out by Captain Sparkes, R.A.M.C., that is rather too much to be expected in the present stage of this work.

Conclusion.—There seems to be no doubt that if the treatment of the sick is to be left to the discretion of the infected, and no stronger method is to be used than persuasion through the Chiefs, as is the case at present, syphilis will make still more remarkable ravages throughout the country, and in my opinion, will bid fair to wipe out the race. According to native returns, the general death-rate of this part of the country exceeds the birth-rate, the greatest

loss of population occurring in the first year of life. The infantile mortality rate is rarely below 300 per 1,000, commonly it is 500 per 1,000, and I have been assured that it sometimes assumes even greater proportions. The connexion between syphilis and the wastage of infant life seems too obvious to require further elaboration.

From what has been said it will be seen that from the purely medical or therapeutic point of view, the checking of the spread and the reduction of the incidence of acquired syphilis among the population, is not a problem of great difficulty.

It remains to be seen whether the authorities will insist on the attendance of the sick. The industrial development of the country is undoubtedly making great strides, but is as yet only in its infancy. It is an axiom that the demand for labour increases with the economic development of a new country. Here the demand is increasing, but the supply is actually on the decrease. Venereal disease is mainly responsible for the situation. One would think that from the economic point of view alone the problem is one that presses for a solution.

I wish to express my indebtedness to Capt. E. B. Place, District Commissioner, Masaka, for the accompanying photographs.

PARTHENOGENESIS.

By Colonel R. H. FIRTH.
Royal Army Medical Corps.

To the ordinary reader possibly the above word may be somewhat disturbing, but let him be not dismayed. Parthenogenesis is a phenomenon of common occurrence in Nature, although limited to certain groups of animals. What is termed gamogenesis is the predominant method of reproduction in the greater part of the animal world ; now, parthenogenesis is the converse procedure and may be described as being a method of reproduction of the species without fertilization. The results of some almost sensational experimental work in recent years have considerably modified scientific ideas on the mechanism of reproduction, where two well defined sexes are concerned.

Loeb and others, in their classical researches, showed that in animals in which gamogenesis is normal, the ovum could be induced to develop without fertilization by the male element, by a suitable adjustment of the environment. This was effected in various ways, such as by adding certain salts to the water in which the ova were contained, by changes of temperature, or by the action of carbonic acid gas. In each of these ways it is obvious that some stimulus is supplied to the ovum, but such stimulus is not necessarily specific. The earlier work on these lines by Loeb has been much extended by others, and the results confirmed. As a rule, the segmentation of the ovum induced by such artificial means comes to a stop after a short time, but this point of arrest in development varies greatly in different groups of animals. The more advanced stages have been secured in the case of the marine worms, but a far greater success has been attained with the star fishes and sea-urchins, in which complete adult development has been observed, and two of these artificially fertilized or artificially developed animals have been kept alive for as long as eighteen months.

The earlier work in the study of parthenogenesis was done on invertebrates, but Bataillon of Dijon has carried the observations among the vertebrates with considerable success. He chose as his subject the common frog, and his method of procedure was to take ripe eggs, just about to be laid, and to puncture each with a very fine platinum needle. The eggs were then placed in water. Less than an hour afterwards the dark pole of the eggs began to rotate upwards. It may here be stated that frog's eggs are black at one

pole and light at the other; unfertilized frog's eggs lie with the light pole uppermost, and the earliest sign of fertilization is a rotation of the dark pole to the top. In Bataillon's observations, there was unmistakable evidence of the formation of an embryo in three days in some two per cent of the punctured eggs, followed a few days later by the appearance of tadpoles. In three months, most of these tadpoles were well on their way to metamorphosis to the perfect adult or frog form.

In this journal, it is unnecessary to discuss the technical points suggested by these remarkable observations, but it is obvious that they involve the conclusion that the process of fertilization is not specific, nor in the case of these creatures an event consequent only on the influence of the male element. It is true these successful observations have been made only on species in which fertilization takes place externally. But, the success attained with such a highly organized animal as the frog warrants not only further work in this direction, but suggests it to be not unreasonable to expect, in spite of the difficulties of the technique, that artificial parthenogenesis may be induced in animals in which fertilization takes place internally. These advanced scientific studies have a further lesson to teach us, or, perhaps, make us pause in some of our criticisms of statements contained in the Book which is the basis of Christian belief. In making this reference, the writer of this note writes in all reverence, and with every desire to handle the subject in such way as to excite the least hostility. The point in mind will be clear to most; but it is obvious that, once recognized that parthenogenesis, even in the lower vertebrates, is a demonstrable phenomenon, the difficulties associated with the Biblical accounts of the birth of the Christ will be materially removed. This generation may not live to see the removal of all the difficulties which stand in the way of a scientific explanation of many things which are still mysteries, yet, in the light of what little glimmer we possess, it is desirable that hasty criticism of unintelligible things should be avoided.

United Services Medical Society.

THE CLEARING HOSPITAL AND THE EVACUATION OF SICK AND WOUNDED FROM AN ARMY IN THE FIELD.

By Lieutenant-Colonel H. E. R. JAMES, C.B., and Major C. E. POLLOCK, *Royal Army Medical Corps.*

An Austrian publication[1] represents the complicated problem of evacuating the sick and wounded from an army in the field in an attractively simple and graphic form, and we thought we might try to represent the evacuation of the sick according to our organization in a somewhat similar manner. This paper contains our personal views with which you will probably not altogether agree, but which we hope will be the means of extracting the opinions of experienced officers present to-night on this most important subject.

In this paper we propose to discuss :—

(1) The functions of the Clearing Hospital.

(2) The evacuation of sick and wounded from an army in the Field.

1. The Clearing Hospital.

As "Royal Army Medical Corps Training, 1911," has only recently been issued we have quoted somewhat fully its instructions on the clearing hospital. Paragraph 251 defines the duties of this important unit thus : "The clearing hospital is a unit specially set apart for the evacuation of the sick and wounded collected by the ambulances. It is the pivot upon which the removal of sick and wounded turns, as it is the central point to which the collecting zone converges and from which the evacuating zone and distributing zone diverge, and is the unit which the D. M. S. holds for establishing the channel or flow of sick and wounded between divisional ambulances and the line of evacuation."

Para. 253 tells us that it is normally located at the advanced base, that it may have to send out personnel to accompany sick and wounded being brought in from the medical units, and that it may have to be advanced close up to the division to receive the sick and wounded. In certain circumstances the clearing hospital may form a series of rest stations.

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[1] "Behelf zur Lösung von Aufgaben a.d. taktischen u. operativen Sanitätsdienstes," v. Hoen u. Szarewski.

Para. 254 says a clearing hospital must be prepared to advance or to send on detachments at any time . . . . the personnel should be told off as rest station parties and as a main body. The equipment should similarly be divided into what will be required with the rest station parties and what should accompany the remainder of the unit.

Para. 255 gives the normal personnel of a rest station party as 1 officer, 1 or more serjeants and 4 or 5 rank and file, and suggests the equipment which should be taken.

Para. 256 states that the rest station party will take over existing buildings and prepare them for the reception of sick and wounded.

Para. 258 tells us that transport will, when required, be provided by the I.G.C.

In order to fulfil all these duties we find that the personnel allotted to this important unit is: 8 officers and 77 other ranks. ("War Establishments for 1910-11," p. 140.)

The medical equipment, Field Service Manual Army Medical Service (Appendix iv, p. 71), is: Medical companions and water bottles, 4; surgical haversacks and water bottles, 8; field medical panniers, 2; field surgical panniers, 2; field fracture boxes, 2; antiseptic cases, 10 (or reserve dressing boxes, 10).

Clothing and necessaries are shown in Appendix xxviii, p. 109.

The Ordnance equipment is given in detail in Army Form G, 1098-66: the only point to be remembered is that although called a hospital this unit has no beds, merely 210 stretchers.

It is thus apparent that the clearing hospital is supplied with all that it requires except transport, for which it is dependent on the I.G.C.

After these somewhat lengthy preliminaries we will proceed to discuss how the personnel and material may be best employed in carrying out the duties assigned to the clearing hospital. We suggest that on mobilization the personnel should be divided into a hospital section or main body, one convoy section and two rest station parties. This is practically what the R.A.M.C. Training lays down. We have constructed a table showing our suggested allotment of personnel to each of these detachments. The first column shows the existing establishment, the second the proposed hospital section, the third the convoy section, and the fourth two rest station parties. The proposed arrangement is, of course, open to criticism, and in fact we are asking for it; only in criticizing obvious deficiencies in personnel of the various sections, please remember that Column I gives you the whole establishment from which you have to find all your detachments.

PERSONNEL OF CLEARING HOSPITAL.

I—Present Establishment		Suggested Sub-Divisions: II—Hospital Section	III—Convoy Section	IV—Two Rest Station Parties: A	B
Lieutenant-Colonel	1	1			
Majors	2	1	1		
Captains or Subalterns	4	2		1	1
Quartermaster	1	1			
Warrant Officer	1	1			
Serjts. — Nursing duties	2	2			
Serjts. — Steward	1	1			
Serjts. — Dispenser	1	1			
Serjts. — Cook	1	1			
Serjts. — Packstore-keeper	1	1			
Serjts. — Clerk	1	1			
Serjts. — General duties	1		1		
Bugler	1	1			
Corpls. — Dispenser	1	1			
Corpls. — Cook	1	1			
Corpls. — Clerk	1	1			
Corpls. — General duties	4	1	1	1	1
Privates — Stewards stores	1	1			
Privates — Cooks	2	1		1	0
Privates — Pack stores	1	1			
Privates — Clerk	1	1			
Privates — Ward duties (17 N., 14 G. D.)	31	22 (12 N., 10 G. D.)	3 (1 N., 2 G. D.)	3 (2 N., 1 G. D.)	3 (2 N., 1 G. D.)
Privates — Washermen	2	2			
Privates — Batmen	8	5	1	1	1
Privates — General duties	14	9	2	1	2
Total	85	60	9	16	

85

II—Hospital Section	III—Convoy Section	IV—Two Rest Station Parties
5 Officers	1 Officer	2 Officers
1 W.O.	1 Serjt.	2 Corpls.
7 Serjts.	1 Corpl.	1 Cook
1 Bugler	6 Privates	11 Privates
4 Corpls.		
42 Privates		

Hospital Section.—In this we have left one medical officer in charge, three medical officers doing duty, the quartermaster, warrant officer, all the serjeants holding special appointments and the majority of the ward and other special orderlies. All the special duties in a hospital would thus seem to be well provided for.

Convoy Section.—We have placed one of the majors in charge of the convoy section; the remaining personnel has been selected on the principle of only taking from the hospital section the minimum personnel to carry out the duties.

Rest Station Parties.—You will notice that only one cook is allowed for two rest station parties. We would have preferred to take both cooks (privates) and allot one to each party, but feared

the wrath of the officer commanding clearing hospital; we have therefore added one G.D. orderly as acting-cook to the second rest station party, although, as a matter of fact, only one rest station party is likely to be detached at a time.

Although told off to different sections, the personnel, unless actually required for those special duties, would remain at head-quarters and take its share in the general work of the hospital.

When in an enemy's country all the personnel, but especially the officers and N.C.O.s, should make a habit of noting anything likely to be of use in forming or expanding a hospital, *e.g.*, suitable buildings, collections of straw, poultry in farms, firewood, &c. In war things cannot always be supplied just when required, and the man who knows exactly where to lay his hands on any necessary article is invaluable.

Transport.—The clearing hospital has no transport of its own. When it is required to move, transport is provided by the I.G.C. We think that the efficiency of the clearing hospital as an evacuating unit would be greatly enhanced by providing it with its own motor transport, say ten 3-ton motor lorries. This would enable the clearing hospital to move off at once when it was required, without any delay for collecting transport. By fitting the lorries with the simple apparatus designed by one of us[1] they could be used for the conveyance of sick and wounded. When fitted with this apparatus each 3-ton motor lorry will take six lying-down and four sitting-up patients, or without any fittings fourteen sitting-up cases. The ten lorries would, therefore, constitute an important addition to our means of evacuating sick and wounded. Unfortunately, the provision of this motor transport would entail considerable expense, and for this and other important reasons is not likely to be supplied. It might be possible, however, to give each clearing hospital two motor omnibuses. With these a rest station party and its equipment could be rapidly sent to any required spot.

Each omnibus after being fitted with a simple apparatus,[2] could be used to convey four lying-down and ten sitting-up, or sixteen sitting-up patients to the railway. If the clearing hospital personnel were hurriedly required to assist the field ambulances the majority of it could be sent up quickly on the omnibuses, leaving a small party to follow with the equipment when the I.G.C. had provided the necessary transport.

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[1] Published in p. 73 of this number.

[2] See Journal of the Royal Army Medical Corps, vol. xv, page 69.

II.—The Evacuation of Sick and Wounded from an Army in the Field.

Our organization for the removal of sick and wounded from an army in the field is in part dependent on the use of empty supply wagons returning to railhead. Before discussing this question we must refer briefly to the system of supply and transport recently adopted for the expeditionary force.

The general scheme is :—

(1) Supplies for the army will be brought up by rail from the advanced base to railheads.

(2) At railheads there will be waiting one supply column for each division, one for the cavalry division and one for army troops.

The cavalry supply column has 57 30-cwt. motor lorries.

Each divisional supply column has 27 3-ton motor lorries.

The army troops supply column has 46 30-cwt. motor lorries.

A certain number of these lorries will probably be fitted for carrying meat, and therefore will not be suitable for the carriage of wounded.

(3) The supply columns run up to the refilling points where they meet their respective trains.

(4) Each division has a train with horsed transport; there are also trains for the cavalry division, mounted brigades and army troops.

The Cavalry train has for supplies	.. 52	General Service wagons.		
,, Divisional train has for supplies	.. 55	,,	,,	,,
,, Mounted Brigade train has for supplies	14	,,	,,	,,
,, Army Troops ,, ,, ,,	14	,,	,,	,,

With the exception of the mounted brigade train, which has only two R.A.M.C. subordinates, each train has a medical officer and from two to five R.A.M.C. subordinate personnel.

At the refilling points the trains fill up with supplies from the lorries of the supply columns and carry these to the troops. There is thus a rapid through communication daily from the troops to the railway.

The diagram I. in the Manual for Supply and Transport Services shows the supply services when a force is marching.

When troops are marching the supply columns should reach the refilling points, which are at the heads of the billeting areas occupied overnight, between 9 a.m. and 10 a.m. When troops are stationary the refilling points are in the brigade areas. The advanced base may be a long way in rear of the army, possibly 100 miles.

When considering the evacuation of sick and wounded the scheme of the supply service must be kept in mind.

Evacuation has to be considered in three military situations :—

(*a*) When the force is marching.

(*b*) When the force is stationary.

(*c*) When a battle takes place.

As you will see later on from our point of view (*a*) and (*b*) closely resemble each other.

(*a*) *When the Force is Marching.*—The first problem to be solved is how to deal with men who fall out while actually marching along the road. The French allot a certain amount of ambulance transport to each regiment (of three or four battalions) to pick these men up and carry them along with their units. There is a good deal to be said in favour of this arrangement, as a man who may be unfit to continue marching on account of some temporary cause, *e.g.*, heat exhaustion, stomach ache, a commencing blister on the foot, or any other cause, may, if carried for a couple of hours, be quite fit enough to march next day, and in this way he would be retained with his unit, which is an important point on service. Some check must be instituted to prevent unauthorized men from getting a lift. This could easily be arranged by only permitting men to ride in the ambulance wagon when provided with a written order or tally by the medical officer. Another point is that the position of the field ambulances on the line of march is usually in rear of the brigade ammunition columns, that is, roughly, some 10 miles behind the head of the main body so that the distribution of ambulance wagons to battalions or even to brigades and their collection again on arrival in billets, might be a matter of some difficulty. As a matter of fact, the distribution of ambulance transport to units on the march depends mainly on the military situation, *i.e.*, proximity to the enemy, and will be decided by the General Officer Commanding the division, who may object to having such conspicuous objects as ambulance wagons dotted about his column. If circumstances permit, we think that one ambulance wagon should be allowed to each brigade, especially at the beginning of a campaign, as reservists are then likely to want a little assistance. If this is not done any man who cannot march must be left under a tree or in a house till the field ambulances come up and take him over.

We now come to the time when the division billets for the night. In order to present the problem more clearly one of us (H. E. R. J.) has drawn a diagram to show what may be regarded as a normal

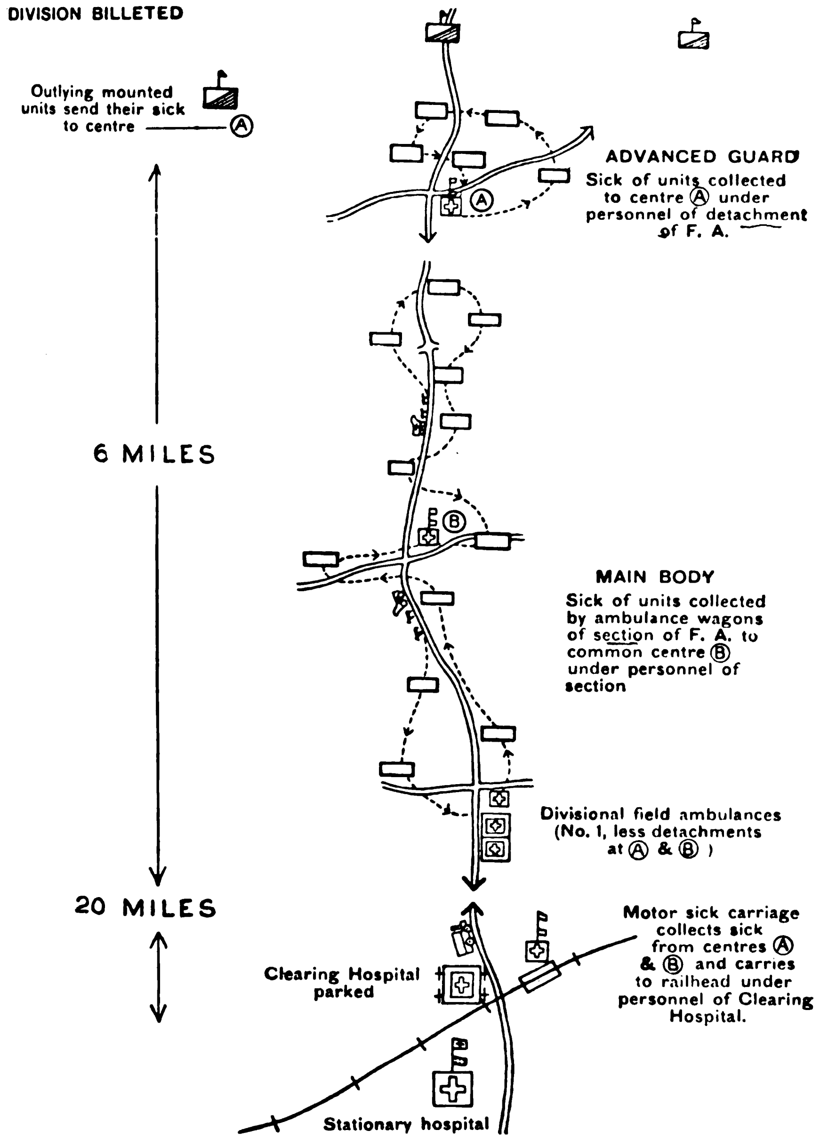

DIVISION BILLETED
Outlying mounted units send their sick to centre Ⓐ
ADVANCED GUARD
Sick of units collected to centre Ⓐ under personnel of detachment of F. A.
6 MILES
MAIN BODY
Sick of units collected by ambulance wagons of section of F. A. to common centre Ⓑ under personnel of section
Divisional field ambulances (No. 1, less detachments at Ⓐ & Ⓑ)
20 MILES
Motor sick carriage collects sick from centres Ⓐ & Ⓑ and carries to railhead under personnel of Clearing Hospital.
Clearing Hospital parked
Stationary hospital

DIAGRAM 1.

distribution of a division when billeted or bivouacking for the night. You will notice that the area covered is roughly 6 by 2 miles.

Any sick from the advanced guard would probably have to be looked after by the medical personnel with the advanced guard.

For the main body one of two plans would have to be adopted—(1) That suggested in Royal Army Medical Corps Training, in which the Administrative Medical Officer details one field ambulance to receive all the sick of the division requiring hospital treatment (see diagram I.), or (2) Billet one field ambulance in each brigade area.

(1) The field ambulances normally march at the rear of the division, and would therefore be billeted at the rear of the divisional area; if the first plan is adopted the field ambulance would have to detach a section to some central spot which would be made known in orders. Sick requiring hospital treatment would have to be sent to this spot, or if unable to walk would have to be collected by the bearer subdivision in its ambulance wagons. This would necessitate a certain though small amount of traffic in the divisional area. Over night this would not matter much, but when the division is marching off next morning the general staff would naturally wish to keep the roads quite free for the movement of troops.

This arrangement has the advantage of not employing more medical units than are necessary to look after the few sick who might have to be admitted to hospital, and also does not appreciably interfere with the administration of the medical service.

(2) By locating one field ambulance in each brigade area it would be much easier to collect the sick from units. On the other hand it involves employing three separate field ambulances to receive probably not more than 20 sick in all, and as these ambulances would be widely separated it would add to the administrative troubles of the Administrative Medical Officer.

Having got so far, the next problem is how to dispose of the sick next morning when the troops march off.

If all the sick have been admitted into one unit it could detach a small party, say one medical officer, two or three orderlies and one or two ambulance wagons, to remain with the sick till handed over: this party could then follow the division, and rejoin its unit in camp. The same plan could be followed when the sick had been accommodated in three different field ambulances, but this would mean leaving three separate parties to hand over the sick, and then rejoin their units.

In exceptional circumstances, when it is important not to detach any of the field ambulance personnel, the sick might be handed over

to the medical officer of the divisional supply train to await the arrival of the divisional supply column. This medical officer and his Royal Army Medical Corps personnel have their own special duties to carry out, and should not if possible be employed as a part of the evacuation service.

The sick must be removed to the railway along with the supply column. If the clearing hospital had its own motor transport a portion of its convoy section might be detailed to accompany the supply column and bring the sick back to the railway. As this is not the case the best plan is for the D.D.M.S. to arrange with the I. G. C.'s staff to send up a small party (two or three men from the convoy section of the clearing hospital should usually be sufficient) on the loaded motor lorries of the supply column.

A motor lorry travelling at say 12 to 15 miles per hour is not exactly an ideal method of carrying a man with a broken leg or one in the early stage of typhoid fever. The discomfort of the journey might be much reduced by equipping a certain proportion of the lorries, say two in a divisional supply column, with Colonel James' design for carrying stretchers. The fittings and stretchers could be attached to the sides of the lorry so as not to interfere with its load. Each lorry could take six stretchers and the fittings; the additional weight would be roughly 200 lb.; stretchers and fittings could be packed in two bundles, and each would measure 8 ft. in length, 1 ft. in width, and the same in breadth. If this were considered to be too bulky each lorry might take two or three stretchers without any fittings fastened to its sides. These would have to be placed on the floor of the lorry and straw or grass pads placed underneath to absorb shock when travelling. Whoever is left in charge of the sick pending the arrival of the supply column should have them classified into lying-down and sitting-up cases, also collect some straw, brushwood, grass, &c., which might help to reduce the discomforts of the journey. When the lorries of the supply column are emptied they have to return to the railway, and the use of the vehicles for the conveyance of sick is conditional on "time permitting." It is therefore essential that the sick should be all ready to be loaded up, as in the event of a delay they might forfeit their right to a passage.

In the above scheme it is assumed that the railway is 30 to 40 miles distant. If there were a railway within a few miles of the billeting area the ambulance wagons of the field ambulance could take the sick to the nearest railway station to await the arrival of a train. In this case the convoy section of the clearing hospital

would be sent up on the railway train with some stretchers, medical comforts, &c., to conduct the sick back to the nearest stationary hospital.

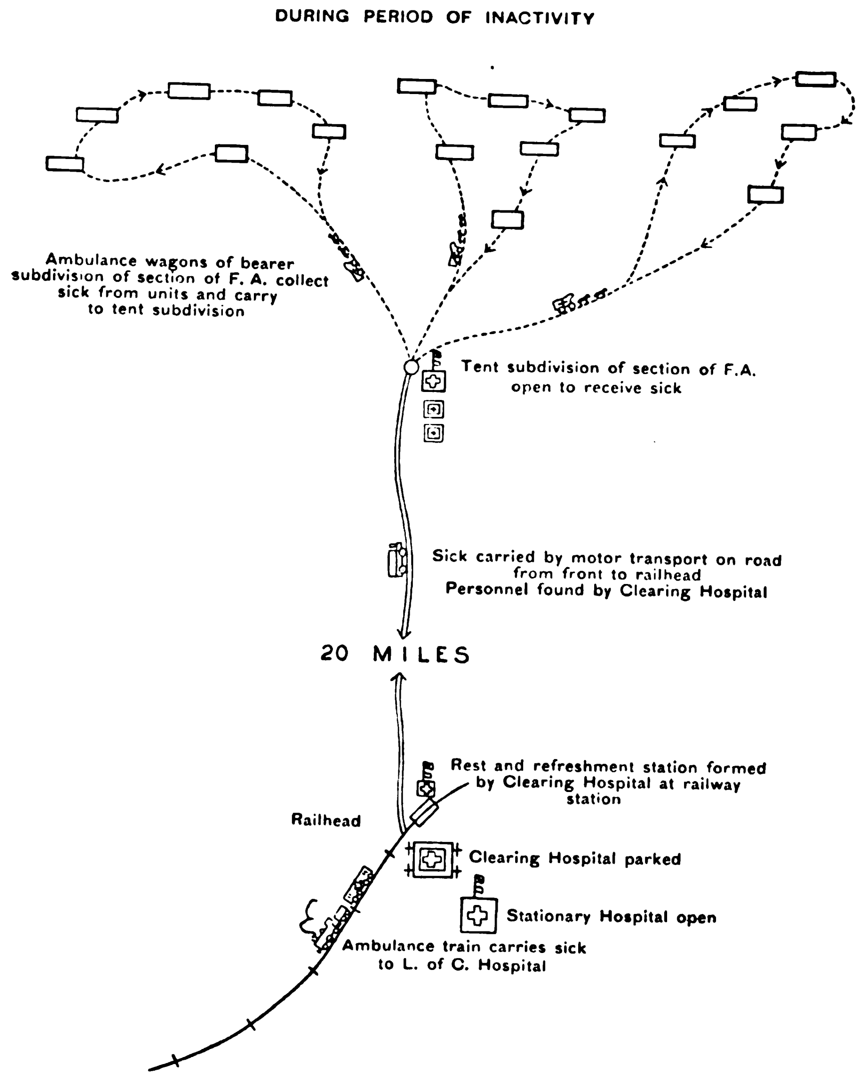


DIAGRAM 2.

(*b*) *When the Force is Stationary.*—The supply service is practically the same as for an army on the march, i.e., the supply column runs up to the refilling points which are in the brigade areas, and there empties into the supply trains sent from the troops.

In each division the Administrative Medical Officer would order one or more field ambulances, according to the area occupied by the troops, to open a section for the reception of sick and casual wounded. He would probably also have to establish a daily service of ambulance wagons to collect the sick from out-lying units.

The Administrative Medical Officer would have to arrange with the A.G.'s branch of the General Staff that all men requiring admission to hospital should be sent daily on ambulance wagons to the refilling points, there to be transferred to the motor lorries of the supply column. If the clearing hospital had its own motor transport a portion of it might under orders from the I. G. C. accompany the supply column and bring the sick back to the railway.

In the absence of its own transport, the D.D.M.S. must arrange with the I.G.C. that a certain proportion of the supply lorries 1.
carry fittings to adapt them for the transport of sick and that a portion of the convoy section of the clearing hospital is to be 2.
taken up on the supply lorries to conduct the sick to railhead. On arriving at railhead a rest station party from the clearing hospital should have refreshments ready for the sick and take charge of them till they can be sent down the railway to the stationary hospital.

(*c*) 1. *When a Battle Appears to be Imminent.*—If a battle is about to take place, the field ambulances must be completely cleared of any sick or wounded who may be in them, and have their surgical supplies replenished. The sick must be evacuated in the same way as when the force is stationary.

While the fight is in progress and the issue still doubtful, the General Officer Commanding the Army is not likely to allow the clearing hospital to come within, say, 12 to 20 miles of the force, as if brought up close to the army, it might, in case of a sudden a.
retirement lead to blocking of a road or even fall into the hands of the enemy and, although it would eventually be sent back again, its services might be lost for a time.

At the same time it must be remembered that if the army is victorious and about to advance, the clearing hospital will be b.
urgently required in order to free the field ambulances and allow them to accompany the troops. If the clearing hospital had its own transport, it could, under the orders of the I.G.C. be kept loaded up on its lorries ready to advance or retire as might be found necessary. As it has not got its own transport the D.D.M.S. will have to arrange with the I.G.C.'s staff to collect the transport

necessary to move the clearing hospital and see that it is in a position to move up as soon as required.

(c) 2. *During and After a Battle.*—Modern battles may last for several days; during the period of fighting the army will probably be more or less stationary and no great change of position is likely to take place.

Slightly wounded men able to walk may reach the field ambulances in a more or less continuous stream or in waves corresponding to the lulls in fighting; most of the severe cases will probably not be brought in till night.

The field ambulances should, therefore, be able to attend to all wounded on arrival and to find accommodation for the serious cases. There is, however, a limit to their capacity, and to prevent them from becoming clogged, the wounded must be evacuated as quickly as circumstances permit. The less severe cases should be got rid of first as they would be better able to bear the discomforts of transport in vehicles not specially fitted for the conveyance of wounded. Severe cases requiring nursing should, of course, be removed to a properly equipped hospital as soon as their transfer can be carried out.

The employment of the clearing hospital during a battle must depend very largely on the military situation. As long as there is any doubt as to the issue of the battle and consequently as to the future movements of the army the General Officer Commanding would not be likely to permit the clearing hospital to establish itself in the proximity of the army. The convoy and rest station sections of the clearing hospital might, after consultation with I.G.C.'s staff be sent up to the nearest railway station. Here they would form a rest and entraining station. The Administrative Medical Officer might arrange through the A.G.'s branch of the staff that wounded who were fit for the journey should be sent daily on the wagons of the divisional supply train to the refilling points. Here they would be met by the convoy section and taken in the supply lorries to the railway entraining station, where they might either be put into returning empty trucks or await an ambulance train for conveyance to a stationary or general hospital.

If the army makes a sudden retirement, the wounded who cannot walk or be carried in the ambulance and other wagons would have to be left with some personnel to look after them.

If the army is victorious and about to advance, the field ambulances must be set free to accompany the troops. The clearing

hospital personnel would have to be sent up quickly to take over the wounded in villages, towns, &c., or wherever they were, and wait for its equipment to follow on unless it could be sent on at the same time. It is under these circumstances that the possession of its own motor transport would be most valuable. As it is, the clearing hospital would be immobilized until the I.G.C. could find transport to evacuate the sick. He might obtain this by unloading one or both reserve parks and using their wagons. Each park consists of one company Army Service Corps, and has 144 general service wagons for supplies. Each general service wagon can take two lying-down or eight sitting-up cases, so that one company could take 288 lying-down or 1,152 sitting-up patients at each journey.

In conclusion, we would again remind you of the three-fold nature of the duties which the clearing hospital has to carry out, viz., to take over the sick and wounded of three field ambulances, to superintend their evacuation to the railway, and to form a rest station at the railway station.

In most of the foreign organizations, with the exception of the Austrian, which is somewhat elaborate, the field medical unit corresponding to our clearing hospital has a smaller *personnel* and very little equipment, the latter being obtained by requisition locally, but in these organizations there are field medical units specially organized to undertake the transport of wounded and to form road and railway rest stations. The new French field organization provides for reserve field ambulances without transport; when the field ambulances with the troops become immobilized the reserve ones are called up to take over the transport from the immobilized field ambulances, and are then ready to advance with the Army.

In the foreign army medical organizations the services of specially trained detachments provided by voluntary aid societies are made use of to supplement the regular Army medical establishment in the evacuation of sick and wounded.

DISCUSSION.

Lieut.-Colonel M. W. Russell said: One of the first points raised in the very comprehensive paper read is the disposal of casualties on the march. As the authors have pointed out, in the normal order of march of a division on one road the Field Ambulance transport is some 10 miles from the leading battalion of the main body. This

means that men falling out from the leading units will be miles from these units when the force reaches its billeting area, and will be for some considerable time lost to the fighting strength of the force. It means that it is impossible to tide men over their temporary difficulties by giving them a short lift or carrying their equipment for a while, and then restore them to the ranks in time to reach their billets with their units. It means an *avoidable* loss of fighting men, and often of the best men, for these will struggle on until the strain reaches breaking point, and then be disabled perhaps permanently, and certainly for the immediate object in view. These losses in the aggregate will mount up to large figures. Our duty is to convince the General Staff of these losses and of their avoidability, and then the appropriate remedy of distributing some of the ambulance transport throughout the column will be applied, as it has been applied in other armies. It is not a medical question only, but essentially a military one.

With regard to the new system to be introduced for the supply of an army in the field, and its relation to the medical service, the following points seem to call for attention.

The advanced base will be very much farther away than at present, perhaps 100 miles or more.

From the advanced base the supply railway trains will be sent up daily to a railway regulating station, where the divisional supply railway trains will be diverted to various so-called railheads, probably on different lines of rail, according to the position of the various divisions. These railheads are variable, and may change from day to day.

At the railheads the mechanical transport divisional supply columns will take over the supplies and convey them daily, some 30 or 40 miles perhaps, to refilling points, where they will be transferred to divisional supply trains, and thus conveyed to the troops.

Returning sick and wounded must follow the same route in the reverse direction.

The first point which seems apparent is that the advanced base will be too far away now for the clearing hospitals to be located there. These must be moved up as far as the regulating station, with a stationary hospital alongside to take the overflow, pending further evacuation down the line, and to take over when the clearing hospitals are pushed up for a battle.

A convalescent depot is also desirable here to accommodate men whom it may be possible to return quickly to the ranks.

The problem to be solved is, how to bridge the gap between the field ambulances and the regulating station.

There are three stages:

(1) The intra-divisional stage between the field ambulances and the divisional train.

(2) The stage of the divisional supply column (M.T.).

(3) The stage of the supply railway train.

The following arrangements were made on the Eastern Command Administrative Staff Tour held last month for the purpose of practising the new transport scheme.

The refilling point where the column transfers supplies to the train is normally situated at the head of the billeting area.

The field ambulances must therefore pass it on their march forward with the troops.

Taking the normal rate of admission to the field ambulances at 3 per 1,000 daily, we should have for each division some fifty men to be sent back each day.

A divisional standing order was issued directing the field ambulances concerned to take any sick requiring transmission down the line to the refilling point daily on their march out, and there hand them over to the train for transference to the clearing hospital party with the supply column when it came up, one field ambulance leaving, if necessary, a small personnel (some four or five men), to care for them and assist in their transference to the column vehicles. This personnel would rejoin their unit the same day, going forward with the train. It might not be necessary to leave any personnel if the medical establishment of the train were thought sufficient for the duty, as might sometimes be the case.

In rare instances the refilling point is situated outside the billeting area. This will usually be before an impending battle, when the field ambulances will be urgently wanted with the troops, and when it will therefore be very undesirable for them to detach any of their vehicles. Under these circumstances it was thought possible that vehicles of the train might be sent to the field ambulances before they marched out, to relieve them of their sick and convey them to the refilling point.

A standing divisional order was therefore issued to the effect that under these circumstances the Administrative Medical Officer should communicate overnight to the Officer Commanding the train the number and locality of the sick requiring to be taken over, and that the Officer Commanding the train should arrange to send vehicles to take them over in the morning before the field ambulances marched, and convey them to the refilling point for transference to the column.

The next step was to arrange for their conveyance to railhead. This was done by sending up from the clearing hospital of each division a detachment of one officer and twelve men, as a convoy section to work permanently alongside the divisional supply column. They were to go up with the column, take over the sick at the refilling point, transfer them to the column vehicles, and look after them *en route* to railhead.

To enable this to be properly done some small amount of special transport was considered necessary for them, and two motor omnibuses were applied for, for the use of each convoy section. These were required to carry forward the convoy medical personnel, medical comforts

and some stretchers and equipment for the sick *en route*, as well as replenishments of medical stores for the medical units in front; and on the return journey to bring back seriously ill men for whom the lorries were not well suited.

The third stage, the conveyance from railhead to the regulating station, was effected by the I.G.C. ordering a fitted box truck or other vehicle to carry five lying-down cases, and a coach to carry fifty sitting cases to be attached to each divisional supply railway train daily. For this service a second detachment of the clearing hospital personnel, consisting of one officer and eight men, was detailed to travel up and down with the supply railway train with the necessary medical appliances and comforts. There were said to be no railway difficulties in this measure.

In this way the daily sick transit between the field ambulances and the regulating station was provided for in an adequate manner to deal with the routine evacuation of sick from each division.

At the regulating railway station were located:

The clearing hospital: 1 stationary hospital, 1 convalescent depot, 1 advanced depot of medical stores.

There is one point more I should like to allude to. The feasibility of this method of clearing the sick and wounded depends on their being able to stand the method of transport. Recently the French have carried out some experiments in this matter in connection with their medical manœuvres. A clearing hospital was established at Vincennes and casualties were brought to it from Gravelles, a distance of 21 miles. Some were carried on these 3-ton lorries, especially fitted with stretchers, and it is a little disquieting to learn that the lorries did not travel at a quicker rate than 4¼ miles an hour, and that the casualties complained of being severely jolted, and this on good roads in the immediate vicinity of Paris.

One would like to see experiments made in carrying men at the proposed rate, 10 to 15 miles an hour, and for the proposed distance, 30 to 40 miles. The distance is a very serious factor. It may perhaps be taken for granted that many of the wounded will be found able to stand the journey at the required speed; the speed cannot be seriously diminished without disorganizing the supply service, which is of course inadmissible. But if a proportion of the wounded, such as broken thighs, cannot stand the mode of transport, special transport becomes essential. Here the French experiments were very encouraging. At the same manœuvres it was found possible to carry 6 lying down cases on a roomy touring car chassis, fitted with what is called a Brichot apparatus, at 22 miles an hour, without any jolting or jarring. If special transport is found to be necessary for a proportion of cases, the problem of its provision would not seem to be a difficult one.

The necessity of having as few vehicles on the road as possible is admitted, but the only way to prevent blocking is to have enough and suitable vehicles to deal with the inevitable traffic. The giving of some

special carriage for sick must therefore largely depend on whether it will help or hinder the keeping of the roads clear. If the lorries are found to be unsuited to carry all classes of casualties at the speed required for the efficient carrying out of the supply service, a small number of special vehicles seems to be the best means of ensuring the clearance of the roads so much desired.

Lieutenant-Colonel J. F. BEATTIE said that the discomfort suffered by wounded in transport to the rear was much exaggerated. From his experience in the Afghan war, he thought that a badly wounded man was so glad to be going away from the fighting area that the discomforts of the journey sank into insignificance.

Surgeon-General SIR LAUNCELOTTE GUBBINS said that as a result of the medical manœuvres at Tidworth, it was found that transport was necessary for clearing hospitals, and it was necessary that general service wagons should be convertible so that they could take wounded. Colonel Macpherson was much impressed with the importance of clearing hospitals, and thought that stationary hospitals should be abolished and mobile sections of general hospitals substituted; in practice stationary hospitals very rapidly became general hospitals. Sir Launcelotte Gubbins agreed with this, and thought it would be well to abolish stationary hospitals and increase the clearing hospitals. There should be no half way between the hospitals of the front and the general hospital; the stationary hospital was uncomfortable, it was not properly equipped for the full care of patients, and the sooner a man got into the comfortable surroundings of a general hospital the better.

Surgeon-General SIR THOMAS GALLWEY thought that a clearing hospital would never be so far from the front as the writer had suggested, no modern army could fight so far from railways. The disposal of sick on the line of march presented no difficulties, as an army in war moved so very slowly; in manœuvres it was different, for there the army made rapid marches. In Natal, in the operations about the Tugela, he got bearer columns only to act at the front and the field hospitals became in reality clearing hospitals for the bearer columns, and what is now called the clearing hospital acted as a stationary hospital. A stationary hospital was necessary at railhead for the purpose of sorting out, taking temporary care of, and despatching sick and wounded down the line. Stationary hospitals were also necessary for lines of communication, as intermediate rest stations and for the care of cases which could return to the front after a few days. A general hospital was a big thing and it was difficult to move it up along the lines of communication; of course, if one split the general hospitals up into sections, they could act in the same way as stationary hospitals.

Surgeon-General H. R. WHITEHEAD thought that it was most essential that the clearing hospitals should have a mobile section to send forward and relieve the field ambulances of their patients. It was most important that the field ambulances should not be called upon to send

their sick back, they had already enough to do with getting them from the front and giving them their first attention. The clearing hospitals should come up and take over from the field ambulances, and the mobile section could start this operation. The personnel of the clearing hospital seemed very small for the purposes it was to be used for. His general impression was that it was impossible to give the clearing hospitals their own transport. With regard to the question of leaving a portion of the personnel of a field ambulance to look after patients till the clearing hospital took over, he thought this should be avoided, as it was very difficult in war time for people to regain their units when they had once got detached from them. A stationary hospital at railhead was very necessary, and he was inclined to agree with Sir Thos. Gallwey about the desirability of retaining stationary hospitals; whether they were still called stationary hospitals or whether they were called section or general hospitals was a minor matter.

Major E. B. WAGGETT asked whether, in this country, the transport of sick to and from clearing hospitals was not to be done by voluntary aid detachments.

Surgeon-General W. H. McNAMARA said that his experience was that on service one never got half the personnel and equipment which was laid down in regulations, and it was a mistake to build up an over-elaborate scheme based on a personnel and equipment which would certainly not be forthcoming. The simpler one made one's arrangements the better; every hospital at the front must be prepared to treat sick, transport sick, and do everything for sick. He thought that medical officers should have practice in the organization of sick convoys. In actual practice a man would not get any personnel, except himself, for the convoy, and he would have to make use of the slighter cases for the service of the sick. It was impossible to provide special transport for the carriage of sick and wounded to the rear, everything must be done by return transport and by requisitioned carts. Surgeon-General McNamara thought that a division was too big a unit for medical purposes, a brigade was about as much as one could overlook effectively. He emphasized his opinion that simplicity in the arrangements was essential and that to over elaborate was only to court failure.

Major S. LYLE CUMMINS raised the point as to whether it was sound to carry sick, many of them suffering from intestinal disorder, in carts which would afterwards be used for the carriage of food and clothing. He suggested that as far as possible our own ambulance wagons should be used for sick and the returning transport carts for wounded.

Major POLLOCK, in reply, said that lorries fitted with Colonel James' apparatus were quite comfortable even at a good speed, in spite of the French experiences. With reference to Major Cummins' remarks, he did not know what could be done with the sick if one could not use supply wagons for them; there was plenty of time between journeys to disinfect them if this was thought desirable.

Clinical and other Notes.

A CASE OF DIFFUSE TRAUMATIC ANEURYSM AND LIGATURE OF THE FIRST PART OF THE SUBCLAVIAN.[1]

By Captain C. G. BROWN.
Royal Army Medical Corps.

Ligature of the first part of the left subclavian artery is an operation attended by many difficulties and dangers. I have only been able to find two successful cases recorded of ligature on the right side and none on the left. My references are, however, limited. Erichsen condemns the operation as "bad in principle" and "most unfortunate in practice," and considers that it should be "banished from surgical practice." Hence a few notes on a recent successful case may be of interest.

Private C. was brought to the hospital on the evening of August 25, 1911. He was faint and his clothes were blood-stained. He had been on guard, had fainted, and fallen forwards on to his bayonet, the point of which had entered through the left anterior axillary fold for an uncertain distance. There was no bleeding from the wound, but there was evidence of a collection of blood in the subclavicular region and inner part of the axilla. He complained of an aching distended feeling in the arm. The wound was dressed and pressure applied. The temperature in the evening was 100·6°.

The patient had a restless night, but no external hæmorrhage; there was marked pulsation and a bruit over the subclavian swelling, which had not increased in size. The left radial pulse, which was at first feeble, was now equal to the right. There was apparently slightly obstructed venous return from the arm. The temperature was 99·8° in the morning and 100·4° in the evening. He had another restless night, and on the morning of August 27 he complained of severe pain down the arm, which was slightly swollen; the pulsation, bruit, and size of the swelling were unaltered. The temperature was 99·6° in the morning and 100·4° in the evening. He had a very restless night, almost delirious with pain, and attempted to tear off his bandage. On August 28 the arm was more swollen, and the obstructed venous return more obvious. I saw him for the first time on this day in consultation with Lieutenant-Colonel F. J. Morgan, R.A.M.C., and decided to operate at once. The temperature was 99·4°.

Operation.—The usual incision for ligature of the third part of the subclavian was made, the omo-hyoid was pulled up, and the outer border of

[1] Reprinted from the *British Medical Journal* of December 7, 1911.

the scalenus anticus exposed. Owing to the clavicle being very much pushed upwards and forwards the wound was of considerable depth. No trace of either subclavian artery or vein could be found external to the scalenus anticus muscle. The wound was extended inwards and the sterno-mastoid partially divided; the depth of the wound increased, and presently a large artery, partially overlapped on its inner side by a vein, was exposed, descending vertically along the inner border of the scalenus anticus. The wound was now very deep, and the greatest care had to be exercised. Unfortunately at this point a small vein was torn close to its junction with the large vein and the wound was flooded with blood. A ligature was placed on this after much trouble and waste of valuable time. The artery was now compressed by the finger and the radial pulse was at once obliterated; pulsation below the clavicle also ceased. The vessel was taken to be the first part of the subclavian and was ligatured. The passing of the ligature took some time, as I had to proceed with the utmost caution, and the depth of the wound and the condition of the patient did not warrant me in tracing the artery any further. The wound was sewn up, leaving a gauze drain. The axilla was then opened, clot and serum evacuated, and a large drainage tube inserted. The temperature in the evening was 102·8°.

On August 29 the part was dressed, a light plug inserted in the upper wound, and a tube left in the lower. The temperature was 99·4°. He stated that he was absolutely free from pain in the arm, but there was slight tingling of the fingers. There was no pulsation below the clavicle and no radial pulse. The arm was kept swathed in cotton wool.

On September 4 he was doing very well; there was a little serous exudation from the upper wound.

On September 18 both wounds were completely healed; there was some stiffness about the muscles of the shoulder, which was being massaged. No pulse could be felt in the radial artery.

On September 27 he was discharged from hospital, complaining of some numbness of the first and second fingers.

On October 11 he was marked "light-duty" for one week, before resuming full military duty on October 18, 1911. No pulsation was felt in radial artery.

The chief point of interest about the case was the abnormal course of the artery. When first exposed I thought it must be the common carotid from its vertical course. The result of the ligature, however, leaves no doubt that it was the subclavian. The vessel must have either (1) made a very high arch in the neck on the inner side of the scalenus anticus; or (2) taken origin from the common carotid in the neck instead of from the arch of the aorta, though this is an abnormality I have never read of. The almost immediate relief of the pain, presumably due to nerve pressure, was a gratifying feature. I am indebted to Lieutenant-Colonel F. J. Morgan, R.A.M.C., for his valuable assistance during the operation and for permission to publish this case.

DESCRIPTION OF A METHOD OF ADAPTING A MOTOR LORRY FOR THE CARRIAGE OF SICK AND WOUNDED.

By Lieutenant-Colonel H. E. R. JAMES, C.B.
Royal Army Medical Corps (Retired Pay).

The intention of this adaptation is to provide motor lorries of the pattern used by the Army with a simple and portable apparatus that will enable them to carry sick with comfort. The important points are:—

(1) That the apparatus shall not be bulky.

(2) That its use shall not demand structural alterations to the vehicle.

(3) That it shall be fairly rosilient, but not excessively springy.

(4) That the fullest advantage shall be taken of the space.

For the purpose of this account it is supposed that, when emptied, the lorries carrying the stores of the clearing hospital will be fitted up for the carriage of the wounded by the use of apparatus always carried in or on them.

Within certain limits weight is not a consideration in these heavy motor vehicles. The 3 ton lorry is the one here spoken of. Its internal dimensions are approximately $12 \times 6 \times 2\frac{1}{2}$ ft.

This adaptation requires two pairs of ash bars 3×2 in. in section, and of length to fit transversely within the body of the lorry.

The bars forming the upper pair are provided with iron hooks which are fastened to the under sides by screws, and which fit over the top edges of the sides of the lorry.

The lower pair are raised by blocks of wood, of 3×2 in. $\times$ 9 in., which have spikes on the under surface to prevent slipping. The blocks have their long axes at right angles to the supports to which they are screwed. They rest upon the floor of the lorry.

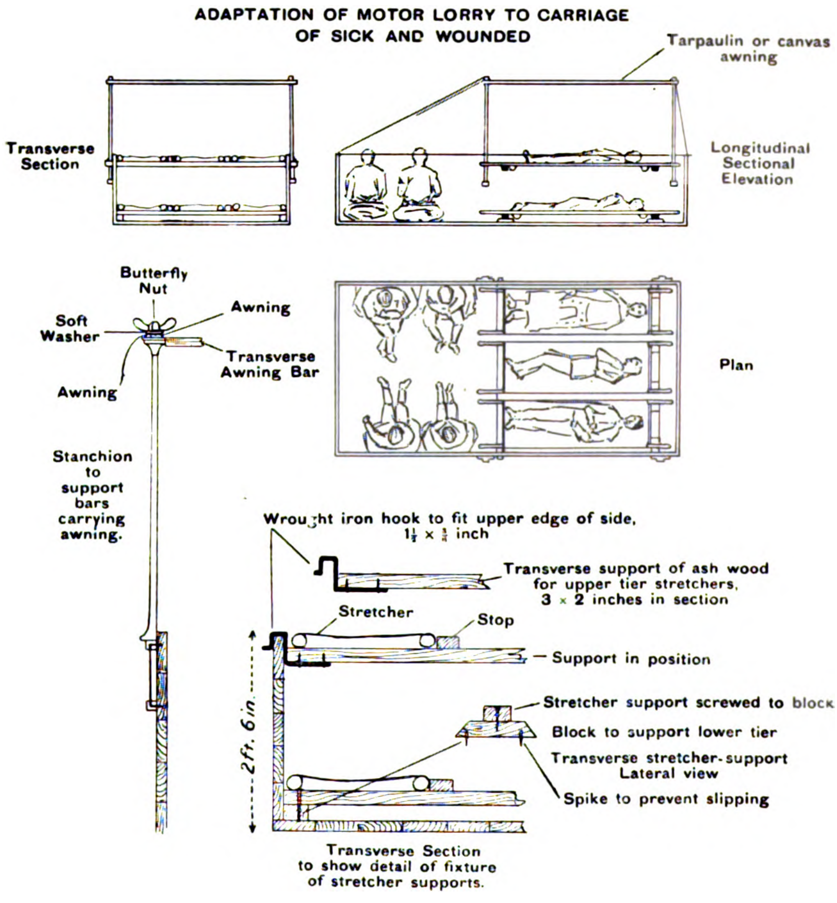
The bars are approximately 6 ft. long, and each pair supports three stretchers, the handles of which rest on the bars close to the traverse. Blocks of proper width are lightly fastened to the upper surface of the bars, to prevent lateral movement of the stretchers. The combined spring of the bars and the stretcher handles will absorb shock. The stretcher slings will be used to fasten the stretcher to the supports.

To give shelter, an awning of tarpaulin or canvas is provided, and four iron stanchions to carry longitudinal and transverse spars are fitted into two iron loops, each on the outer surface of the sides of the lorry.

The awning is supported by spars on the top of the stanchions, the screws of which pass through holes in the awning, butterfly nuts being used to keep the spars and awning in place. The circumference of the awning is provided with 12 eyelet holes and lanyards to tie where necessary, and staples are fixed to the sides and ends of the lorry to which the lanyards are fastened.

The two tiers of stretchers are placed in the front part of the lorry, the front stretcher handles being close to the front wall.

The front transverse supports are placed conformably to this, and the rear ones in such a position that the stretchers are firmly supported. The traverses of the stretchers are included in the turns of the slings which fix the stretchers to the supports.



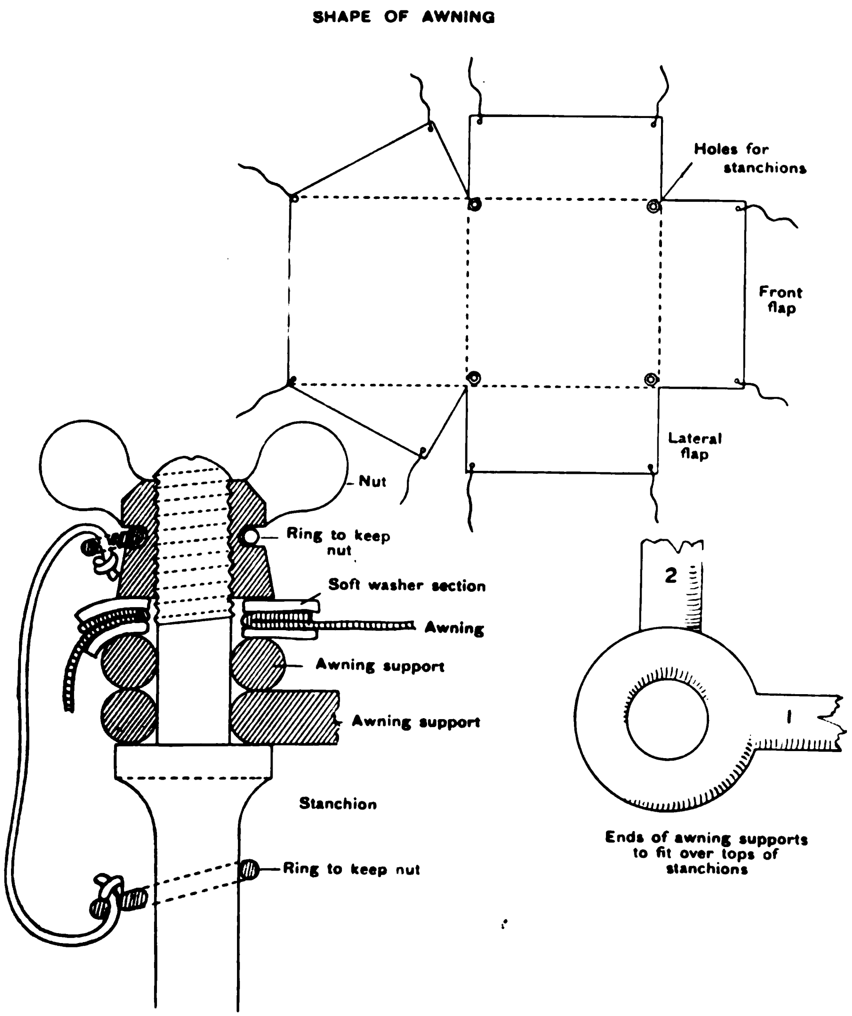
The floor of the space in rear of the stretcher may be covered with sacks of straw for the accommodation of sitting-up wounded and the wagon orderly; the arms and equipment of the wounded will be placed here.

The apparatus consists of:—

Four bars of ash 3 × 2 in. × 6 ft., two of them fitted with iron hooks

of $1\frac{1}{8} \times \frac{3}{8}$ in. iron, two of them with blocks $9 \times 3 \times 2$ in. which can be turned lengthways to the bar when not in use.

Four iron stanchions 4 ft. in length, $\frac{3}{4}$ in. iron, shaped, and with male screw at end. Four butterfly nuts to fit screws.



Two ash spars of 1 in. × 1 in., 8 ft. long, with flat iron ends or iron bars (round) $\frac{5}{8}$ in., perforated or looped in the case of iron, being used to fit over the screw at the end of each stanchion.

Two similar ones approximately 6 ft. 4 in., but according to the width of lorry.

Eight flat iron square loops provided with 1 in. screws fastened to outer side of lorry receive the lower ends of the stanchions.

Twelve iron staples of ½ in. opening and 1½ in. long to drive into side of lorry to fasten awning.

An awning of about 16 × 13 ft. shaped and fitted with eyelet holes at edges and lanyards to fix it to the staples.

The apparatus would pack into a space of—

Extreme length	8 ft.
Extreme thickness	1 ft. × 1 ft.

It would lie under the stores and not appreciably interfere with the space, or could be fastened to the outside of the lorry.

The apparatus could be fitted immediately the stores were emptied out while moving along the road, and should not take more than a quarter of an hour under the most unfavourable circumstances.

The cost would be small.

HYDROCELE EN BISSAC.

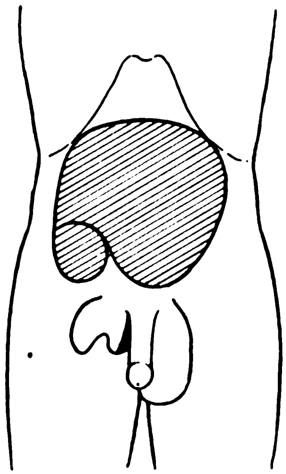
By Captain A. G. CUMMINS.
Royal Army Medical Corps.

The following case presents, I think, a sufficient number of unusual features to make it worth recording. In the month of June 1911, an Arab of about 25 to 30 years of age was admitted into the El Obeid Civil Hospital. He gave the following history:—

Some ten or twelve years ago a swelling was noticed in the right scrotal sac. This swelling appeared to vary in size from time to time, but it grew steadily larger. It never reached a size sufficient to interfere with an active out-door life which included a good deal of riding. The tumour lasted thus—not troublesome, but inconvenient—until four months ago. Its character then slowly began to change and the swelling extended gradually from the scrotum into the right inguinal canal, and then more rapidly spread over the whole abdomen. The testicle was drawn up out of the scrotum into the inguinal canal. When examined on admission the condition was as follows:—

The abdomen was distended, and on inspection resembled a moderate condition of ascites. The swelling was elastic and dull and gave a distinct percussion wave. The abdomen appeared to be uniformly enlarged but, on percussion, resonant areas were found in both flanks and below the xiphisternum. The resonant area in the left flank was more extensive than that in the right. When the patient contracted his abdominal muscles, as in rising from a lying to a sitting position, it was seen that the muscles were superficial to the swelling. In the right inguinal canal was a second and smaller tumour about the size of a

tennis ball. This was also dull and elastic and was partially reducible. In this swelling the testicle could be felt. This smaller swelling became larger in size on coughing, and on pressing on the larger swelling. The right scrotal sac was empty and invaginated, the invagination being caused by the traction of a fibrous band which could be felt running up into the inguinal canal.



The condition was considered to be one of Hydrocele en Bissac and operation was advised. The usual incision for hernia was employed and the smaller swelling was exposed and isolated. The presenting portion was incised and about two gallons of ordinary hydrocele fluid was removed. It was then found possible to draw out the whole tunica vaginalis without very much difficulty, for, though the portion in the inguinal canal was very thickened and adherent, the upper part under the muscles was quite thin and easily separated. The operation was then completed by cutting away the tunica vaginalis and replacing the testicle in the scrotal sac. The wound was closed by suturing the external oblique tendon, leaving only room for the cord. A drainage tube introduced through the most dependant portion of the right scrotal sac was removed the next day. Recovery was uneventful.

NOTES ON TWO AND A HALF YEARS' SURGICAL WORK AT THE ROYAL HERBERT HOSPITAL, WOOLWICH.

By Lieutenant-Colonel J. B. WILSON and Captain A. J. WILLIAMSON.
Royal Army Medical Corps.

In this paper it is proposed to give a short account of some of the major surgical operations performed during the period. This of course only represents a small part of the work of the division. A large number of operations, classed as minor and performed under general or local anæsthesia, have also been done. There is also the work of the venereal clinic described elsewhere by one of us. The ophthalmic specialist has also a clinic largely attended by officers, ladies, men, women and children more or less connected with the garrison.

A considerable amount of work was also done by the specialist in nose, ear and throat diseases, Major G. A. Moore. The removal of tonsils and adenoids, and the submucous re-section of intra-nasal spurs, deflected septa, &c., as performed by him, were in a large number of cases attended with good results as regards immediate comfort and rapid improvement of general health (which were quite remarkable).

During this period, also, the services of the specialist in operative surgery were utilized for consultation in various stations in the Command on thirty occasions. Whenever possible, operation cases were brought into Woolwich, but eight operations were done by him at out-stations.

These consisted of 5 for acute appendicitis, 1 for fractured spine, 1 for acute osteomyelitis and 1 tracheotomy.

At the Families' Hospital, Woolwich, the following cases were dealt with: 1 acute appendicitis, 1 exploratory laparotomy, 1 sarcoma of the kidney, 1 empyema, 1 ventral hernia.

The operative specialist also assisted the officer in charge of the Families' Hospital (Major Fuhr, D.S.O.), in his major gynæcological operations.

To return, however, to the operative work at the Herbert Hospital.

It must be noted that, for obvious reasons, in military hospitals in peace time, the field for operative surgery is limited both in the number and variety of cases, compared with that of the large hospitals in civil life.

This must be held to account for the comparatively small number of 293 major operations in the period under consideration. These were fairly equally divided between the officer in charge of the division and the surgical specialist, with the exception of a certain number kept for young officers anxious for practice in this part of their work.

The principal of these or at least the ones occurring most frequently will be found in the following table:—

Operation	No.	Healed first intention	Suppurated	Recovered	Died	Remarks
Laparotomy for tumours, injury or obstruction	7	5	—	5	2	1 case of volvulus brought in moribund; 1 after injury
Gastro-enterostomy	2	2	—	2	—	—
Gastrotomy	1	1	—	1	—	For acute gastric hæmorrhage, numerous punctate hæmorrhages were found, but after washing out and stitching up, uninterrupted recovery took place
For appendicitis. Clean cases in quiescent interval	14	12	2 very slightly	14	—	1 slight stitch abscess owing to scabies; 1 ditto; patients were in bad health, both abscesses superficial
Appendix abscess	7	—	7 were suppurating before operation	7	—	—
Appendix abscess, with gangrene or general peritonitis or both, *before operation*	5	—	5	2	3	—
Hæmorrhoids	13	13	—	13	—	—
Radical cure of hernia	43	42	1 slightly	43	—	In 2 of these series, recurrence to a slight degree has been noted
Varicocele	36	35	1 slightly	36	—	Patient appears to have disturbed the dressing on first night in this case
Varix	26	26	—	26	—	—
Recent fractures, plating, wiring or removing fragments	6	5	1	6	—	1 old-standing case in which femur had to be divided and re-united. Slight suppuration occurred but did not interfere with final good result
Internal derangement — knee-joint	14	14		14	—	—
Complete mastoid operation	2	—	Abscess found at operation, both cases	2	—	—

To go into details of these cases.

Gastro-enterostomy.—The two cases under this heading presented nothing unusual. They were both done for old standing duodenal ulcer with thickening of the gut. The posterior method was adopted and the results were satisfactory.

Gastrotomy was performed in a very acute case of gastric hæmorrhage. It was hoped to find and ligature or excise the bleeding point and probably do a gastro-enterostomy. On opening the stomach, a condition of minute punctiform hæmorrhages was found. After washing out the stomach, and looking for any bleeding point, nothing large enough to carry a ligature was found. The viscus was stitched up and rapid recovery took place.

Appendicitis.—Operations under this head are divided into the three classes in the table. Those under Class I, 14, were all done by the "Gridiron" method. The appendix was removed, the ligatured stump inverted into the cæcum, and the wound closed in layers. Two of these cases suppurated slightly. In neither case did the abscess go deeper than the external oblique. In one the infection was due to the presence of the itch insect in the skin, though he had previously been treated for this affection.

An enormous amount of literature exists on the subject of appendicitis. We venture to mention the following simple rules which we find useful:—

(1) It is wise to remove the appendix *in the quiescent period after one definite attack of appendicitis.*

(2) *The best treatment of acute appendicitis is operation at the earliest possible moment* (R. P. Rowlands, *Brit. Med. Journ.*, March 12, 1910).

Rule 2, however, does not militate against the proposition that in a *subsiding* case of acute appendicitis it is better to wait and operate in the interval. What is a subsiding case? The answer to this is: *If there is any one symptom in the case which is not subsiding operate.* (Mansell Moullin). The case of Corporal M. illustrates this point. He was transferred from an out-station with a history of one or more previous acute attacks of appendicitis, for operation. On admission he got a slight exacerbation, and it was determined to operate on him the following morning. It was then found that all symptoms had once more subsided except a slight pain in the right iliac region. The same afternoon he felt quite well but the slight pain still persisted. He was therefore operated on at once. He was found to have a large appendix abscess full of foul, dark greenish pus. The abscess was drained and he made a good recovery. It is difficult to tell what one is going to find, even in the interval cases.

Private L., was admitted on April 6, 1910, from furlough with a history of an acute attack of abdominal pain and vomiting, on March 29, 1910. This recurred a week later, on which his civilian doctor sent him

to us, but on admission his temperature and pulse were normal, and he was quite well except for slight iliac tenderness, which quickly subsided. He was kept under very close observation, remained absolutely well for twelve days, and was then operated on as an interval case. The appendix was found thickened and distended with pus like the finger of a glove; the abscess partly involved the wall of the cæcum. The appendix was removed, the peritoneum carefully cleaned without drainage, and he made a rapid aseptic recovery. From these cases it is clear that a man may carry an appendix about with him in a condition analogous to a lyddite shell about to explode, and yet show scarcely any symptom of his condition.

Hæmorrhoids.—Under this heading thirteen cases were operated on. The method adopted was learnt by one of us from Dr. A. B. Mitchell, of Belfast, who first described it (*Brit. Med. Journ.*, February 28, 1903). It is now described in various text-books. The piles are clamped in the long axis of the rectum by Kocher's forceps. The pedicle is transfixed above the points of the forceps by stout catgut on a curved needle; without removing the forceps the pile is then cut off with scissors, close along the forceps blades. A continuous suture is then passed round and round them, and when it is finished the forceps are withdrawn and the suture tightened and tied. The original article referred to is illustrated and well worth looking up.

Hernia.—There are forty-three cases under this head. Bassini's well-known method modified to meet individual cases was used. We found it on the whole most satisfactory. These forty-three cases include a few which had been operated upon by others previously (mostly before joining the service) and in which the hernia had recurred. We found in these cases, by excising most of the old scar, we were able to get a good result. We sutured the wound in layers, finishing with a subcuticular silkworm gut suture for the skin, which certainly leaves less of a scar than any other. While on the subject of hernia, the work of Murray,[1] of Liverpool, might be mentioned, as we think it of great practical interest, and believe that his opinion is one with which military surgeons will concur.

Briefly put, the author's idea is that all inguinal hernias are protrusions of abdominal viscera into congenitally preformed hernial sacs. In other words, they are all due to a congenital defect or want of development in the cord, and are of the variety described in text-books as "infantile" or "congenital," only they do not come down in infancy or childhood and hence are potential instead of actual at that time.

If this is so, the claim that a rupture is caused by a strain in the gymnasium or riding school is incorrect. A soundly developed man will

[1] "Hernia, its Cause and Treatment," 2nd edition, W. Murray, F.R.C.S. Liverpool.

not get a hernia under these circumstances. The claim that such a rupture is "caused" by the service has therefore no more foundation in fact than that gonorrhœa is contracted from a "wet-saddle, a cold stone, or falling off a log" (all of which reasons we have heard earnestly urged). The idea, however, does not militate against a man's perfectly fair claim that such exercises may have caused abdominal contents to descend into the sac and thus aggravated his condition.

Varicocele.—Thirty-six cases were operated on. Bennet's operation as described by him (*Brit. Med. Journ.*, March 2, 1901) is the one we performed. He does not, however, recommend transfixion of the cord before ligature. Having once, however, noticed a freshly ligatured cord crawl out of the ligature like a live worm or cobra and retire into the abdomen, to give its owner a chance of bleeding to death from the cut and patent ends of the vessels, we prefer now to carefully transfix both cut ends of the cord before tying them together.

For this purpose we use iodine catgut (Moschoswitz's dry method catgut is best).

The disadvantage of silk is shown by the following case:—

Private F., a thin, pale, anæmic boy, was sent to the Herbert Hospital with a history of seven months' constant neuralgia, following an operation for varicocele (performed in a civil hospital to fit him for the service). He said he could not stand it any longer and wished something done. He suggested castration. On June 4, 1911, one of us excised the old scar and religatured the cord with catgut. Inside the dense mass of tissue taken out was a space filled with yellowish clear fluid and containing two thick silk ligatures.

On waking from anæsthesia, the boy said that his pain was gone. It did not recur, and fifteen days later he went out perfectly well, with an extraordinary improvement in his general health.

Varix.—Twenty-six cases of this kind were operated on. In most, Trendelenburg's method of taking out a couple of inches of the long saphenous vein, where it dips into the cribriform fascia to join the femoral, was carried out, as well as local removal of the affected vessels. In several cases, by the use of Mayo Robson's dissector, it has been found possible to remove the entire vein from this point to the calf, through two or three incisions, ½ in. in length across its course.

Operations on Recent Fractures.—Under this head only six cases have occurred in which it has been considered advisable to operate on recent fractures. We have at Woolwich the great advantage of being able to use the X-rays for diagnostic purposes in all cases of suspected fracture.

With regard to treatment, modern methods seem to fall under two heads, viz.:—

Open operation for wiring or plating as a routine method for recent

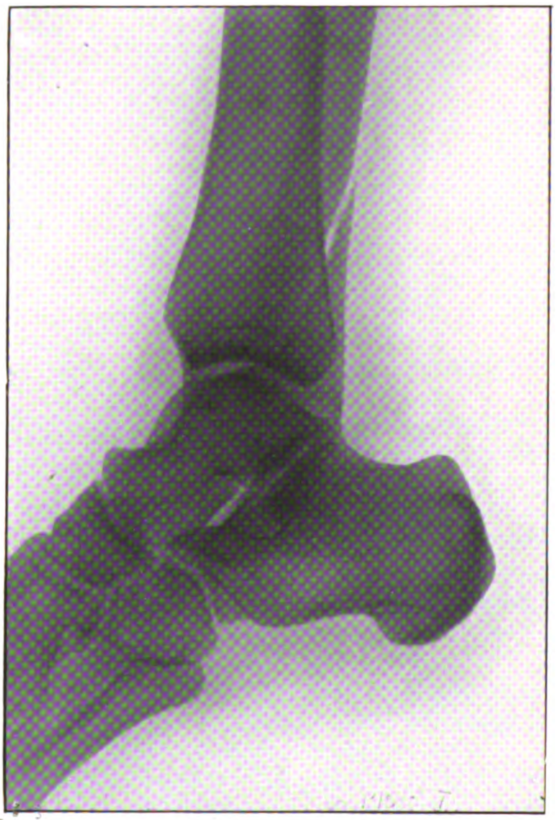


Fig. 1.

To illustrate "Notes on Two and a Half Years' Surgical Work at the Royal Herbert Hospital, Woolwich."

By Lieut.-Col. J. B. Wilson and Captain A. J. Williamson.

fractures as suggested[1] by Mr. Arbuthnot Lane, in cases when accurate apposition cannot be got without it; and early massage and passive movement and the avoidance of splints, as practised by Lucas-Championniere.

Everyone seems to agree that the old method of "immobilization," splinting, &c., with the attendant adhesions, atrophy, stiffness and wasting from disuse, is, to put it no more than mildly, open to grave objections.

The constant use of X-rays has shown us how very frequent certain fractures are, which scarcely appear to have been recognized at all in former times.

We have also observed cases in which bones, even large bones, have been fractured with no displacement and very slight symptoms.

Among the fractures revealed by the X-rays, which might otherwise have been overlooked, is the very common one of the lower end of the fibula (fig. 1). We have collected seventeen cases of this.

Major Prynne has also dealt with this subject in his recent excellent article[2] in this Journal. This fracture is usually caused by landing on the feet from a height when one foot meets some inequality which causes it to turn inwards.

The sudden strain on the inter-osseous and the external lateral ligaments appears to be the cause of fracture.

Fractures of the scaphoid bone of the wrist have been found to be not uncommon. In three cases of outward and backward dislocation of the elbow the internal condyle of the humerus has been found to have been pulled off and dragged between the articular surfaces of the joint. In all three, the fragment was removed by operation and the attached fibrous aponeurosis was stitched back to the humerus. The fragment was too small and too widely separated to peg, but all three made a perfect recovery. This, however, is an injury which would be detected easily without the X-rays. There is one symptom which might be noted in these obscure cases of fracture which we have not seen mentioned in text-books, and that is hæmorrhage.

The old classical symptoms of fracture, such as "crepitus," &c., do not seem quite so reliable, now that they can be checked by the X-rays, as they formerly did. Crepitus produced by rubbing the fractured ends of the bone together was held to be a pathognomonic sign of fracture. Well, this seems an uncomfortable kind of thing to do to people suffering from shock after an accident and as a rule they do not like it at all. Besides which it is quite easy to get well-marked crepitus by moving about, say, the shoulder joint of many people who have never had a fracture of any

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[1] "Operative Treatment of Recent Fractures," W. Arbuthnot Lane, F.R.C.S. 1905).

[2] Journal of the Royal Army Medical Corps, January, 1911, p. 71.

kind, and we have met with many obvious fractures in which crepitus could not be elicited.

We have, however, noticed that we are almost certain to find a diagnosis of fracture confirmed by the X-rays where there is very great bruising or swelling from extravasation, after an injury near a joint, or in the continuity of a bone.

We believe the usual explanation of this symptom is, that when a bone is broken and its blood-vessels are thus torn across, owing to their intimate connection with the rigid walls of the Haversian canals they do not contract so quickly as those in the soft tissues. Hence the extravasation is much greater. Our experience confirms this view to the extent that we have always noted a much greater degree of extravasation in fractures (and especially in small fractures near joints) than in injuries of equal violence where fracture has not occurred. Fig. 1 is an example of this kind of fracture, which is a very common one. It would, without X-rays in most cases, be difficult or impossible to recognize. When a man arrives in hospital with a "sprained ankle" caused by violently turning the foot inwards at football, or in jumping from a height in the gymnasium, and when there is an unusual amount of extravasation about the ankle-joint, particularly the outer side of it, an X-ray examination has revealed this fracture, practically "every time."

Figs. 2 and 3 represent the fractured bones of the left leg before and after treatment by Mr. Arbuthnot Lane's method of plating.

Dr. T., R.F.A., was admitted on December 26, 1910, with a fracture of both bones of the leg due to direct violence by the kick of a horse. There was great displacement and enormous swelling from extravasated blood. On the 28th he was operated on by cutting down on the tibia, dividing the periosteum, removing all clots and fibrous material, &c., from between the fractured tibial ends, and having got them into accurate apposition fixing them there as shown in fig. 3 by Mr. Law's steel plate and screws, and closing the periosteum over the plated bone; the wound healed soundly, but bony union was delayed partly owing to the rickety tendency of the patient and partly owing to his restlessness. He opened up his splint one night and lit a match to have a look at the leg, with the result that he set fire to the cotton-wool and burnt his skin rather badly. The ultimate result, however, was firm union, no deformity or shortening resulted, a result which we think could scarcely have been obtained without operation.

The case of boy T. is interesting. He dislocated his elbow outwards and backwards by a fall from his bicycle. He was taken to a civil hospital near where the accident occurred, and the dislocation was reduced. Some six weeks later he presented himself at the Herbert Hospital with the elbow in perfect position and the swelling all gone. He was, however, unable to straighten the arm, or to flex it beyond a right angle. X-ray examination revealed the presence of a piece of

Fig. 2.

Fig. 3.

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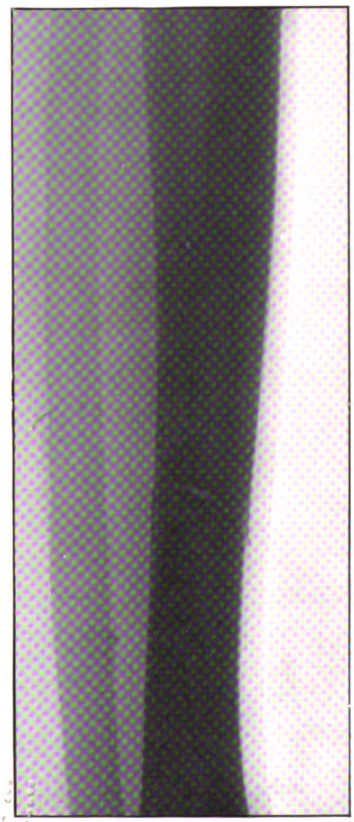

FIG. 4.

To illustrate "Notes on Two and a Half Years' Surgical Work at the Royal Herbert Hospital, Woolwich."

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bone in the joint. This was removed through an incision over its posterior and internal aspect. The foreign body proved to be the tip of the internal condyle. It was excised and the tough fibrous aponeurosis in which it was embedded was sutured back in position to the periosteum and lateral aponeurosis of the humerus from which it had been torn. The wound healed aseptically and perfect motion was restored after a short course of massage.

Fig. 4 is inserted as an example of the occurrence of a complete transverse fracture of the tibia without the least displacement. Boy Messenger L. had his leg fractured by direct violence. He was brought at once to the Herbert Hospital, and fortunately had not tried to walk on it. He made a rapid and uneventful recovery treated by massage and rest between two large sand-bags. In cases of this kind the periosteum is presumably not torn and therefore holds the bone in position.

Internal Derangement of the Knee Joint.—Fourteen cases have been dealt with during the period. These have included tearing or dislocation of both internal and external semilunar cartilages, loose bodies, and thickened alar fringes, or a combination of two or more of these conditions. Up to the present date, and so far as we are aware, all our cases have resulted in perfect movement being restored to the joints.

The commonest derangement that we have found is dislocation or tearing of the internal semilunar cartilage. We have found a curved skin incision, concavity backwards with its centre about half an inch behind the inner edge of the patella, a very useful one. A flap bounded by this incision can be turned back and the joint entered horizontally at right angles to the skin incision and parallel to and above the inner border of the tibia and semilunar cartilage. Entering on the tibial border below the cartilage has been recommended, but we have been unable to find any advantage in this.

The above skin incision does not interfere with the duties of a mounted man as, if the saddle is gripped with the internal condyle of the femur and the inner aspect of the head of the tibia as it ought to be, the scar will be in front of these points and out of the way of trouble. We generally drain the joint with silkworm gut for forty-eight hours, in those cases in which the disease is of some standing and much effusion is liable to occur.

The above remarks, we know, will contain nothing new to the specialist, but they may be of interest to the general duty officer, as they deal with conditions which are frequently brought before him, and anything which has been said is the result of practical experience.

We do not propose to enter into the question of the technique employed by us. A discussion on this subject in the Section of Surgery of the British Medical Association this year was introduced by a paper by Professor Alexis Thomson,[1] of Edinburgh University.

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[1] Reported *British Medical Journal*, October 28, 1911.

The methods outlined by Thomson are practically those which we have followed, and we would venture to express a complete agreement with the remarks therein made by him, more especially about the discredited controversy regarding the terms aseptic and antiseptic. There are, as he says, many methods, but none in which some sort of chemical agent is not employed. It is the result which, if successful, is aseptic, not the process. In conclusion, we would express our indebtedness to our X-ray room assistant, Corporal Jones, R.A.M.C., who has prepared the plates for this article and who has always given us his willing and intelligent co-operation in our X-ray work.

A BRIEF NOTE CONCERNING THE TREATMENT OF PRIMARY LATERAL CURVATURE OF THE SPINE BY MEANS OF SIMPLE EXERCISES.

By Captain W. W. BROWNE.
Royal Army Medical Corps.

I have recently had under my care a girl, aged 12, overgrown and delicate, suffering from marked lateral curvature. She had been treated with exercises and massage for about a year, but the condition was getting worse. The dorsal curve was convex to the left, and the lumbar curve to the right. I asked the parents to let me see the child do her exercises, and, as I expected, she performed them in a way that could only tend to increase the deformity. These exercises were chiefly as follows:—

(1) Stretching the arms alternately above the head, in front, and laterally.

(2) With the arms above the head bending forwards and downwards.

(3) With the arms above the head bending laterally.

They were not supervised nor done regularly, therefore they were seldom performed in the same way from day to day and faults crept in. For instance, one side was worked more than the other, and the head was allowed to hang. Except in the case of a trained person most exercises to be done properly require supervision, and certainly must be done regularly, if good is expected to result. I think it is obvious that an exercise improperly performed is useless in a case of deformity, and that it is just as likely to increase the deformity.

I admit the importance of hygiene, suitable food, rest on an inclined board, massage, &c. All these should of course be seen to in the usual way. The only point I wish to discuss is the nature of the exercises which should be employed in treatment.

The exercises I have found useful are four in number, and though very simple, require constant supervision.

The first three should all be done by the patient in a sitting posture,

with the body erect, on the edge of a hard chair or stool of suitable height, *i.e.*, of such a height that when the feet are planted firmly on the floor the leg and thigh will be as nearly as possible at right angles. The feet should be slightly separated. The head must be kept erect, and the chin well drawn in, the hands and arms in the position of "hips firm."

(1) *Lateral Exercise*:—With the shoulders kept in a straight line the spine is slowly bent alternately to the right and left.

Note.—Three things have to be guarded against. A tendency to "hunch" the shoulders, to allow one shoulder to come forward, and to allow one buttock to be raised off the chair.

(2) *Rotatory Exercises*:—The body to be rotated alternately to the right and left.

Note.—The only movement should be spinal, and the head and pelvis should be kept fixed. In this exercise also there is a tendency to "hunch" the shoulders, and for one shoulder to droop.

(3) *Forward Bending*:—This explains itself.

Note.—The shoulders must be kept back, the head erect, and the chin drawn in. The spine is held rigid.

(4) The fourth exercise is different in that it requires a simple apparatus. A bar must be placed across a doorway so that the child can easily grasp it when standing erect. The child stands under the bar and grasps it with the hands wide apart, the head erect, and the chin drawn in. She then raises herself on tip-toe with the help of the bar.

Note.—There is a tendency to pull up unequally with the arms, and also to throw the head back.

The exercises should be carried out just short of tiring the patient. They are of course in no way original, except that I can find no mention of the sitting position in any text-book.

I have found them most effective and easy to carry out, and their success has tempted me to suggest their trial to others. I am indebted to Lieutenant-Colonel C. H. Melville for some criticisms and suggestions.

CASES OF ABDOMINAL SURGERY.

By Captain R. H. BOTT.
Indian Medical Service.

Pancreatic Cyst—Operation—Recovery.

Case 1.—Sepoy Ali Asgarali, aged 25, service three years, was transferred from Loralai to the Combined Indian Troops Hospital, Quetta, on December 10, 1909, complaining of an enlarged stomach and pain over the pit of the stomach.

History of the Present Condition.—Patient stated that the abdomen began gradually to swell one month ago, there was pain over the pit of the stomach and vomiting, bowels were open regularly.

Previous Illnesses.—From his medical history sheet it was ascertained that he had previously been admitted to hospital for appendicitis (once) and for dyspepsia (once).

Condition on Admission.—Patient looked anæmic and weak; temperature normal; abdomen greatly distended, fulness in each flank. On palpation the swelling appeared to be uniform, no definite tumour could be felt, the abdomen was very tense and a fluid thrill was obtainable. On percussion the abdomen was uniformly dull except over a small area in the left hypochondrium. The spleen and liver were not palpable. There was tenderness on pressure in the epigastric region. The tongue was clean, there was no jaundice. There was an apical thrill and an apical presystolic murmur over the cardiac area, and the pulse was small, regular and slightly quickened. There was slight œdema of the feet. The urine was normal. There was no history of syphilis.

Treatment.—Milk diet, rest in bed, calomel and saline purge, and tincture digitalis ♏x. t.d.s.

December 12, 1909.—Paracentesis abdominis—in middle line, midway between pubes and umbilicus. Seventy-eight ounces of fluid withdrawn, pale straw-coloured. Abdomen slightly lessened in size as result of this, and no more fluid could be withdrawn through the cannula, although a fluid thrill was still present, and dulness on percussion was obtained in the flank.

December 15, 1909.—Abdomen slightly larger, pain and pulsation (transmitted) in epigastric region.

December 18, 1909.—Tongue furred, epigastric pain increasing, abdomen very tense.

December 21, 1909.—Paracentesis abdominis again performed, in same situation as on previous occasion, 45 oz. fluid withdrawn, abdomen still protuberant and elastic.

December 22, 1909.—Pulse rapid and weak, epigastric pain continues; last evening commenced vomiting large quantities of dark bile-stained fluid.

I was asked to see him on the morning of the 22nd, and found him lying in bed hardly cognizant of what was going on around, with an almost imperceptible radial pulse, with frequent vomiting, which was becoming fæcal in character. I decided to do an exploratory laparotomy at once.

After preparation of the skin, an incision was made slightly to the right of the middle line, 3 in. in length, commencing about 5 in. above the umbilicus and carried downwards, extending through the skin, rectus muscle and peritoneum. The peritoneum under the upper part of the incision was normal, but over the lower part was thickened and inflamed.

On opening the abdominal cavity the stomach presented in the upper part of the wound. The hand passed within the peritoneum felt a tense elastic fluctuating swelling, filling practically the whole of the abdominal cavity; no intestines were seen or felt.

The omentum beneath the greater curvature of the stomach was scratched through and a swelling containing fluid was opened, some two gallons of dark brown foul-smelling fluid was evacuated, gauze pads being packed around the opening to prevent contamination of the general peritoneal cavity; the inner wall of the cavity was covered with material looking like shaggy lymph, and the walls of the cavity were about $\frac{1}{8}$ in. thick. After evacuating the fluid the liver was seen to be normal in size and the general mass of intestines was situated below the swelling, filling the pelvis. No free fluid was found in the peritoneal cavity.

The edges of the opening in the cyst were brought together by interrupted silk sutures, except at one place where a large rubber drainage tube was inserted, and the edges of the cyst at this place were sutured to the margins of the abdominal incision. The peritoneum was sutured with interrupted silk sutures, and the rectus and skin with interrupted salmon-gut sutures except where the drainage tube passed through and dressings applied. The cyst arose from the region of the pancreas.

During the operation the radial pulse became imperceptible, and liquor strychninæ and ether were given hypodermically, and strong hot coffee was given per rectum on the patient's return to bed.

Digitalin $\frac{1}{100}$ gr. was given hypodermically on the night following the operation, owing to the extremely weak pulse. The patient did not vomit after the operation.

December 23, 1909.—He passed a fairly good night and the following morning was taking small quantities of milk and soda-water, and mutton essence.

December 24, 1909.—Patient rather better. Digitalin $\frac{1}{100}$ gr. hypodermically again given during the night.

Wound dressed, looks healthy, very little dark brown, rather foul-smelling discharge from drainage tube, cavity washed out with sterilized normal saline solution. Temperature normal.

December 26, 1909.—Vomiting on evening of 25th, all food by mouth stopped for twenty-four hours, except a teaspoonful of tepid water occasionally. Then given a gastric sedative mixture, and small frequent feeds of milk and soda-water. Temperature normal.

December 27, 1909.—Patient much better, the cyst is now being daily washed out with hydrogen peroxide lotion, with the result that the discharge is becoming much less offensive.

The patient now made practically an uneventful recovery, except that the discharge from the sinus had a particularly irritating effect upon the surrounding skin, which had to be protected by boracic ointment spread on lint and applied to the skin.

On February 24, 1910, it was noted that the patient had had slight evening fever for four days, and on examination there was a well marked induration situated apparently in the upper part of the left rectus

abdominis muscle, with transmitted pulsation; hot fomentations were applied, and the induration and evening fever quickly subsided; what the cause of this induration was I do not know.

The discharge finally ceased and the sinus closed on March 26, 1910, rather more than three months after the operation.

I heard of the patient six months later, when he felt and was said to be in perfect health.

The chief points of interest in this case in my opinion are:—

(1) The shortness of the history.

(2) The large size of the cyst.

(3) The offensive nature of the contained fluid. I think that probably hæmorrhage had taken place into the cyst cavity, and that the effused blood had been partially digested.

(4) The extremely irritating effect upon the surrounding skin of the fluid escaping through the drainage tube after the operation.

(5) The free fluid in the abdominal cavity that was drawn off on each occasion that paracentesis abdominis was performed, and was probably due to the pressure of the cyst upon the portal venous system.

I was unfortunately not able to have the urine tested for Cammidge's reaction, nor was I able to get the cyst contents examined for the characteristic reactions of pancreatic fluid. It will be noted that both his previous admissions to hospital were for abdominal complaints.

Internal Hæmorrhage—Operation—Recovery.

Case 2.—Ram Dial, a syce, aged 20, was admitted to the Combined Indian Troops Hospital, Quetta, at 6 p.m. on May 24, 1911, complaining of pain in the belly.

History of the Present Condition.—Patient stated that he was kicked in the belly by a mule at 11 a.m. on May 24, 1911, whilst out of Quetta cutting grass; he was then brought to his lines on a mule.

Condition on Admission.—Patient was lying in bed, dorsal position, knees drawn up on abdomen and a very anxious expression on his face. He complained of severe general abdominal pain. His pulse was very rapid and thready and could not be accurately counted. Temperature 99·6° F. The abdomen was rather full, and moved slightly on respiration; on palpation there was general pain and some resistance all over the abdomen, but the pain and resistance were most marked in the middle line below the umbilicus. There was dulness in the hypogastric region and an impaired note in both flanks; and no area of liver dulness could be made out anteriorly. No fluid thrill was obtainable.

After the accident and before coming to hospital he had passed a motion and urine which appeared to be natural. He vomited two or three times before admission to hospital, but did not notice any blood in the vomit.

I concluded that he had probably ruptured some organ within the abdomen, and decided to perform laparatomy immediately. After sterilization of the skin of the abdomen a median longitudinal incision 2½ in. in length extending downwards from just below the umbilicus was made.

On opening the peritoneum a large quantity of dark coloured blood escaped; there was no escape of gas from the peritoneal cavity. No laceration of the gut was discovered, and the liver felt normal. The capsule of the spleen was lacerated near the upper pole of the organ, which did not appear to be enlarged. The kidneys appeared to be normal. The pelvis was full of dark-coloured fluid blood, which also occupied the greater part of the peritoneal cavity. I aspirated about one and a half pints of blood, but could not discover any bleeding vessel. The condition of the spleen certainly did not appear to be sufficient to account for the very free hæmorrhage which had occurred, and I am of opinion that one of the vessels in the mesentery was torn, probably a vein. Shortly after the operation commenced the patient's radial pulse became impalpable, probably the low blood pressure accounted for the fact that I could discover no bleeding vessel. During the intra-abdominal manipulations the patient ceased breathing, and the heart became very slow and irregular. I attempted to massage the heart through the diaphragm; this certainly appeared to have a markedly beneficial effect, and the radial pulse reappeared. Artificial respiration was performed until breathing became re-established.

Owing to the very serious condition of the patient, I did not think it advisable to prolong the search for the source of the hæmorrhage, and I closed the abdominal incision with a single layer of interrupted salmon-gut sutures, and applied dressings and a tight roller bandage. Liquor strychninæ was given hypodermically during the operation, and normal saline solution two pints with brandy 1 oz. at a temperature of 110° F. was given per rectum on the patient's return to bed, and the foot of the bed was raised.

When making the abdominal incision there was no bleeding, owing, I presume, to the very low blood-pressure.

May 25, 1911.—The patient passed a restless night and vomited several times. I ordered no food to be given by the mouth. An injection of two pints of normal saline solution was given per rectum at a temperature of 100° F, also morphia $\frac{1}{8}$ gr. was given hypodermically.

His pulse showed a decided improvement after the saline injection, and came down to 90 per minute. His temperature was normal.

May 26, 1911.—Temperature rose to 101.4° F. last evening, normal this morning. Pulse 92, good.

Complained of pain in his abdomen, which was markedly distended. Enema terebinthinæ ordered, rectal tube passed, and inj. atropinæ sulphatis $\frac{1}{100}$ gr. hypodermically ordered every four hours until three

injections had been given; by these measures the distension was greatly relieved.

Patient still vomited if milk or water was given by mouth, so after the turpentine enema, two pints of warm normal saline solution was given per rectum and retained. Abdominal wound dressed and looked healthy.

May 27, 1911.—Patient better, had a better night, pulse rate and temperature normal, and is now able to retain small quantities of milk and water given by the mouth. Bowels moved naturally in the evening. From this date the patient made an uninterrupted recovery, and was discharged from hospital on June 6, 1911.

I think there are some points of interest in this case:—

(1) From the condition of the patient when I saw him laparotomy was certainly indicated, but beyond finding out the actual condition of affairs within the abdomen and thus satisfying my own mind, I do not think the patient derived any benefit from the operation. I did not ascertain the actual source of the hæmorrhage, as owing to the very low blood pressure the bleeding had stopped when I opened the abdomen.

(2) The large amount of hæmorrhage. I have never previously seen so much blood in the peritoneal cavity. I did not attempt to remove very much of it as I am convinced that provided it does not become infected it does no harm, and I considered it much more important in this case to close the abdomen and get the patient back to bed than to spend time over an elaborate peritoneal toilet.

(3) I think the extravenous injection of warm sterilized normal saline solution is by far the best method of combating severe hæmorrhage or collapse; in this case I wanted the patient's blood-pressure to remain low, and I considered it safer to give a small quantity of salt solution per rectum, whence it would be more slowly absorbed into the system.

(4) I had the good fortune a few days after this operation to see another patient admitted to hospital with a similar history and condition. Patient No. 2 was also a syce; a horse had broken loose in the lines and trodden on the man's abdomen while he was lying on the ground asleep. This man was known to have an enlarged spleen. On admission to hospital he was somewhat collapsed, and complained of severe abdominal pain, especially on the left side. His pulse was 104 but of fairly good volume. There was dullness on percussion in the left loin and flank. Both Captain Browse, I.M.S., who asked me to see the patient with him, and I agreed that there was probably a rupture of the spleen and internal hæmorrhage, but as the man's condition did not appear to be critical, we decided to watch him for some time, and Captain Browse ordered ice to be applied to the splenic region. The patient did not get any worse, and within ten days the symptoms disappeared. It was noticed that when he left hospital his spleen was much smaller than it was prior to his admission.

Captain Browse informs me that he has, on several occasions when doing *post-mortem* examinations, found enlarged spleens bearing marked scars, some of which, in all probability, were the result of previous ruptures.

A CASE OF ANEURYSM OF AORTA.

By Major F. M. MANGIN.
Royal Army Medical Corps.

Private G. was admitted into the Cambridge Hospital, Aldershot, on June 14, complaining of more or less constant pain involving the whole chest, but more marked over the cardiac area. On examination the heart was found to be enlarged and dilated, the apex-beat being diffuse, and about 1 in. outside the nipple line. On admission the pulse was feeble, compressible and rapid, the heart sounds were faint but normal, no bruit being audible. On the evening (9.15 p.m.) of the 14th, patient was attacked with a severe and typical seizure of angina pectoris, necessitating the injection of strychnine, the inhalation of oxygen, amyl nitrite and digitalis. The attack was followed by much restlessness and frequent coughing attended by the expectoration of much blood-stained mucus. On the 15th, the patient's condition remained unaltered, and coarse râles were audible all over the chest in front; as the day went on the pulse became more rapid and feeble, 116 per minute, and the respirations 46. During the night the patient became very faint and collapsed, brandy and strychnine were administered, and he rallied. The cardiac distress was relieved by propping up the patient. A second attack occurred at 4 a.m., which was again relieved by the administration of stimulants. On the morning of the 16th his condition was very grave; during the day he gradually became worse, temperature remaining at 96°, pulse 108 to 124, respirations 48 to 52; cough and moderately profuse blood-stained mucous expectoration continued, together with vomiting, which had appeared on the 15th. Patient remained in this condition, and died suddenly of cardiac failure at 8.5 p.m. June 16.

Post-mortem, thirty-eight hours after death. The body was fairly well nourished, *rigor mortis* present. Estimated weight about 10 st. On opening the thorax the lungs were found to be œdematous, the right weighing 29 oz. and the left 25 oz. The heart was enlarged and the ventricles dilated. The cardiac walls generally were thinner than normal, and there was a fatty deposit on the surface of the organ. The valves were all normal.

In the wall of the aorta, immediately above the left posterior cusp of the aortic valve, an aneurysm the size of a small hen's egg had formed; it was conical in shape, and involved the left coronary artery, the orifice of which was found blocked by a recent small clot. The aortic walls in the neighbourhood of the aneurysmal opening presented appearances of atheroma.

Echoes from the Past.

THE STORY OF THE BRITISH ARMY SURGEON AND THE CARE OF THE SICK AND WOUNDED FROM 1689 TO 1702.

By Major H. A. L. HOWELL.
Royal Army Medical Corps.

(*Continued from p.* 658.)

To return to the Irish War. In June, 1691, the campaign reopened by Ginkel moving from his headquarters at Mullingar. The Irish, under Tyrconnel and St. Ruth, prepared to make a stand at Athlone. The English took part of the town on June 19, but were unable to take the whole town until the 30th, when the troops forded the river with the water almost up to their necks and drove off the Irish. The Irish retired thirty miles and took up a strong position at the hill of Aghrim. On July 12, the desperate battle of Aghrim was fought. The Irish suffered a severe defeat, losing between 6,000 and 7,000 men. The field was so strewn with white corpses that it was described as looking like a pasture covered with flocks of sheep. St. Ruth was amongst the killed.

This battle completed the conquest of Ireland. Galway fell immediately and the last of the Irish Army was besieged in Limerick. Ginkel's army was now well supplied and an English squadron occupied the Shannon. On October 3, 1691, Limerick capitulated and the war was over.

Notwithstanding the reformed medical organization, which on the whole worked satisfactorily, there were many complaints concerning the hospitals (see Calendar of State Papers, Domestic, 1691). Count de Solmes wrote to the King in 1691: "Both officers and men complain of the manner in which the hospitals are conducted, particularly of the way in which the authorities raise money for the hospitals, namely, by deducting sums of money from the soldiers' pay when they are wounded. The authorities also complain of the officers, and there is a general state of dissatisfaction between them." Some replies to questions concerning the campaign, which had been raised by the King, are of interest: "As to the hospitals, the medicines have been bought, and £500 in £1,500 has been saved by ready money being employed." "Biscuit and Cheshire cheese were found in the last civil war in Scotland

to be the most useful and nourishing for keeping the soldiers in better health when marching, and enough biscuit for ten days can be carried by each soldier, and it will keep six months, or longer, which no other bread will do. For these and other reasons it is cheaper in the long run than bread."

In a "Memo. of the Abuses and Faults observed in the Army in Ireland," it is stated: "Many officers and men have perished for want of doctors, and proper care being taken of them in the hospitals; the men in charge of the hospitals pass for doctors, but they are not so. The hospitals must be governed differently." An anonymous letter from Lisburn, dated December 30, 1691, to Mr. John Rayley, merchant, New Queen Street, Cheapside, may also be quoted: "That the worthy members may have a true account how barbarously the poor English have been treated in their sickness by the French physicians and surgeons, let them examine Dr. Dunn and Mr. Charles Tomson, men of experience, honesty and worth, to whom the Army are infinitely obliged."

The losses during the Irish War were as follows: The Irish Army lost in killed, 617 officers and 12,676 men. The number lost by sickness, which must have been very great, is unknown. Story, the historian of the war, put the losses of the English Army thus: "Officers killed 140, soldiers killed in the field 2,037, murdered by Rapparees 800, English and Foreign officers who died during the three campaigns 320, soldiers who died since the landing in Ireland 7,000." "In the last two campaigns few died except recruits, and such as died of their wounds."

Amongst those who joined King William in Ireland was Dr. Patrick Dun, "an Aberdeensman, Physician to the State and to My Lord Lieutenant" (Culloden papers). He was appointed Physician to the Army and accompanied it for some time in 1689 and 1690. Dun was the most prominent physician of his time in Ireland. We must be content here to deal only with his connexion with the Army. He was with King William in the South of Ireland and afterwards accompanied General Douglas to the siege of Waterford. During his campaigns he corresponded with the Rev. Dr. King (afterwards Archbishop of Dublin). From Carik (*sic*) he wrote in July, 1690, asking King to be kind to Dr. Hutton and telling him to give Hutton his money. A postscript runs: "Dr. Hutton's cloke is hanging behind my bed." Hutton, it will be remembered, had been given a warrant to inspect the Army hospitals and carry out reforms in them. Dun's letter shows that Hutton was in Ireland in 1690. In September, Dun wrote from Waterford: "Dr.

Le Can is coming from the Hospitall neare Dublin to relieve me. I hope to be with you in a few days after his arrival; he cometh by sea to Waterford." Dun does not appear to have ever been paid for his services during the campaign. He tried to get a grant of land after the war and petitioned the Treasury for £438 16s. 8d. due to him for his pay "as physician to the hospital during the war in Ireland." He, with others similarly situated, petitioned Parliament for payment of his services as late as 1706. Dun was knighted by the Lords Justices in 1696. In 1704, having represented that there was in Dublin a military hospital without a physician, he was appointed on March 2, 1705, "Physician-General of the Army," with pay 10s. a day.

The most prominent surgeon in Ireland at this time was Thomas Proby, who has been described as "Chirurgeon-General to the Army of the winning side, and an ancestor of the Earl of Carysfort." His patent as Chirurgeon-General bears date August 21, 1699. Proby had a house and part of Phœnix Park, where was afterwards erected The King's Military Infirmary. He was dispossessed of this property by the Lord Lieutenant, and Dean Swift, taking up his pen in his defence, described Proby as "a person universally esteemed." Proby was one of the trustees of Stephen's Hospital. As Chirurgeon-General he was, by virtue of his office, examiner for the Irish diploma in surgery.

The Royal College of Surgeons was not incorporated until 1784, and it appears that previous to that date the Chirurgeon-General possessed the power of examining candidates and granting licences to practise surgery. Thus, in 1733, Mr. Bartholomew Mosse received his licence to practise surgery at the hands of John Nichols, then Acting Surgeon-General. (Mosse was sent with drafts to complete the regiments in Minorca in 1738, and afterwards founded the Lying-in Hospital in George's Lane, Dublin, which was replaced later by the Rotunda Hospital.)

The following is an incomplete list of the chirurgeons who belonged to regiments at the time they were engaged in the Irish War: Thos. Edwards, Latimer Ridley, Jas. Arden, Geo. Bellamy, Jno. Agar, Noë L'Evesque, James Wiley, Thos. Roots, Etienne Roussel, Hy. Musto, Thos. Cunningham, Chas. Dakins, Wm. Thomas, Philip Rose, Jno. Rosse, Claudius Gillart, Jas. Blean, Antony Weldon, Gerald Lisle, Walt. Tooker, Wm. Oliver, Francis Willoughby, and Willoughby's mate Jeremiah Huntingdon. The chirurgeons to the Horse and Life Guards were Thos. Hobbs, Wm. Mills, Gabriel Jones, Pierre Coudroy, Thos. Syson, Nich.

Hubin, and Ant. Rousseau, each troop having its chirurgeon. Of these, Gabriel Jones was drowned at sea in 1697 and his widow Anne was granted a pension of £20 a year. Charles Dakins, who was chirurgeon to the Princess Anne's Regiment (8th King's) went to the Coldstreams in 1690 and is believed to be the Charles Dakins who died on February 3, 1720, aged 60, and was buried in Westminster Abbey.

In 1692 it was decided to send some troops to the West Indies. On August 16, the Earl of Nottingham (Secretary of State), wrote to the President of the College of Physicians: "The Queen intending soon to send some soldiers to the West Indies, and thinking it necessary to appoint an able physician who may take care of directing what shall be necessary for their health, would have you to consider of some person whom you shall think most proper and willing to undertake the service." On August 29, he wrote to the Vice-President of the College of Physicians: "The Queen would have you consider of a person proper to be apothecary to the forces which are going to the West Indies, and another to be his assistant, both to attend the Service thither. She would also have you consider of the kinds and quantities of medicines which may be useful and necessary to be sent with them; in selection of these Dr. William Grimbalston, physician to the forces, is to be consulted." On August 27 was signed a commission for "Dr. William Grimbalston, to be physician-general," and on September 30, the commission of James Hayes, "apothecary, to be apothecary general of the forces which are going to the West Indies." It was also arranged with the Admiralty that during the voyage Dr. Grimbalston was to take care of the seamen as well as of the soldiers in the event of the death or absence of the naval physician and *vice versa*. The Treasury was also directed to advance Dr. Grimbalston and the two apothecaries one quarter of their salaries and to pay for the medicines ordered. Colonel John Hales' Regiment of Foot was amongst the troops sent at this time. The chirurgeon to this regiment was Paul Crosse.

Ever since his accession to the throne of England, King William had been engaged in war against France. By the terms of an agreement with the States General of Holland, England was obliged to help in this war. It has already been noted that a British contingent was sent over to Flanders in 1689. There is little of interest to note except that the English fought very well at Walcourt on August 25. The troops were badly equipped, ill-paid, and ill-disciplined. English troops also took part in the campaign

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of 1690. On the termination of the war in Ireland William was able to increase his English troops in Flanders. Thus at the battle of Steenkirk on August 3, 1692, the following regiments with their surgeons were present, the 1st Battalion Guards, the Royal Scots, the Buffs, 6th, 10th, 21st, 25th, 26th, Fitzpatrick's Fusiliers, Cutt's, Mackay's and Lauder's Regiments of Foot, the Horse Grenadiers and the 4th Dragoons. The fighting was desperate and the British share in the fight glorious. The allied losses amounted to 3,000, most falling upon the British. Four hundred and fifty officers were either killed or wounded. In ten regiments no less than seventy lieutenants were slain. The French losses were about equal to those of the allies but they lost 620 officers. The surgeons must have been fully employed after the battle.

At the siege of Namur, in 1692, the British wounded numbered 2,205, and killed 1,556 (Cal. S. P. Dom). At Landen, in July, 1693, the British regiments present numbered twenty-three. The British lost 135 officers, the allies lost 12,000 men, and the French 8,000.

There is preserved in the British Museum the "Hospital Accompts for the yeare 1692 in the Low Countreys." The manuscript has also bound up with it the accounts for 1693. From the entries in these manuscripts we learn a good deal about the hospital arrangements in this war. Fixed hospitals existed, but the writer can find practically no evidence of the existence of the marching hospitals. Hospitals were maintained at Ghent, Bruges, Brussels, Louvain, and Mallins (sic) (probably Malines or Mechlin). For a time there was a hospital at Terlemont, and, after Steenkirk, several wounded were taken to a hospital at Anguine, including one "Mackensey, a cadett left wounded and naked at Steenkirk." This last was probably not a British hospital, as special payments were made for the care of the wounded taken there, as in the case of a trooper treated in the Dutch hospital at the Hague when on his way to England. There was apparently another hospital at Mallins in which sick and wounded were received between May 17 and October 22, 1692. This hospital was administered by nuns, to whom was paid 4,310 florins 10 stivers for their services during this period, and 200 florins for the care of some sick before May 17. This hospital was either taken over by the military or a military hospital established in the town, for payments were made to seven "nurses and tenders" at Mallins during the year 1693, and the hospital cook at that place received 162 florins for three months' pay. It is not quite clear that the hospitals of St. Elizabeth at Louvain were British military hospitals, as the staff were not paid by

name, as in the case of other hospitals, a single sum of 604 florins being paid "for the soldiers entertained there this yeare." Payments were made in connexion with the Hospital of St. Jean and "the Hospital, in St. Giles, by Bethlem," at Brussels. A barn was added to the latter, 78 florins being paid to a widow for rent of it, and 260 florins rent for the hospital. Eight nurses and tenders received pay at Brussels. John Panticrass, "chyrurgeon to the Hospital of St. Jean," at Brussels, was paid 500 florins, his pay in full from August 6 to January 6, 1692. Lindekins, "chyrurgeon's mate" at Brussels, also received twenty-three days' pay—69 florins. Sixty nurses and tenders, male and female, were paid at 10 stivers a day each, but the hospitals in which they were employed are not mentioned. Payments were made on account of "waggons for the use of the Hospitalls"; 10,000 florins for 12 wagons on July 5, and 650 florins on July 31, 1692. There is no evidence that these wagons were for the use of marching hospitals, but the inference is justifiable when we remember that by King William's Warrants of 1690 wagons were allowed only for the marching hospitals.

With regard to the personnel of the hospitals, the accounts record payments to the following: Colonel Venner, probably as Director or Governor of the hospitals. He held that position in connexion with the fixed hospital at Kilmainham during the Irish war. Mr. Hudson, "Assistant to the Governor," is probably the same man who was Director of the hospitals during Marlborough's campaigns in Queen Anne's reign. Mr Francis Keiglar was Intendant to the hospitals. The Physicians were: Dr. Lawrence, Dr. Le Cane, Dr. Demunck, Dr. Herwarden, Dr. Oliphant and Dr. Bellone. The Master-Chirurgeons were named Wallis, Pringle, David Bonere, Chicorius, Hall, Lekie, Bennet, and Merrick. Chirurgeons Cross, Baker, Anker, Mouillon, Busquet, Le Rouse, Hall, and John Panticrass, also received pay, and the names of the Chirurgeon's mates were Munroe, Menting, Vandyck, Keil, Mein, Wilson, Lee, Ramsay, Barenger, Elliott, Brune, Leber, Bosquett, Cowley, Barere, Morilon, Capuset, Jaine, La Champaign, Kener, Woodfield, Stewart, Chambers, Poole, Southerland, Martin, Anckor, Mieu, Mercer, Johns, Hutchinson, Isaac Reynard, Jean Rismeir, Fairlo, Gladstons, Kernan, John Dasper and John Nox. Mr. Teale drew pay as Master-Apothecary in 1693. Messrs. Eliezar Benson, Wildbore, Bacorer, Caddell, Nellson, Taise, Linderman, and Button were apothecary's mates. Three supernumerary apothecary's mates and seventeen supernumerary chirurgeon's mates are also named. It is difficult to

make out the rates of pay, as most payments were on account and not in full. The physicians drew about 320 florins a month; master-chirurgeons, 210 florins; chirurgeons about 100 florins; and chirurgeon's mates, 94 florins 10 stivers to some, 90 florins to others.

Soldiers paid towards the hospital expenses; in the Horse, two stivers a week; in the Foot, one stiver a week. The hospital stoppages for sick or wounded in hospital were three stivers a day per man. This was afterwards raised to five stivers a day.

When men were invalided to England they were given a few florins; for instance, six soldiers, "criples" (sic) going to England were paid 22 florins 15 stivers. Sick and wounded were conveyed to the hospitals at Ghent and Bruges by boat. One entry in the accounts shows payment of ten pistoles for boats to carry the sick from Furns to Bruges.

There is mention of a military hospital in Sterne's "Tristram Shandy." Good authorities have found Sterne's references to this war to be accurate. It was at Landen that Corporal Trim was wounded. He tells us: "It was noon next day before I was exchanged, and put into a cart with thirteen or fourteen men, in order to be conveyed to our hospital."

King William was a very unfortunate general, but was so skilful that the French were unable to reap the full benefit of their victories. His greatest victory was the capture of Namur during the campaign of 1695. The English, under Lord Cutts, greatly distinguished themselves during this siege, and it was here that the 18th Royal Irish Regiment earned its proud motto, "*Virtutis Namurcensis Præmium.*" This regiment lost 297 of all ranks in the final attack, and the total English loss amounted to over 2,000 killed and wounded. Fourteen British Regiments were present. The war ended with the Peace of Ryswick, in 1697, and Parliament proceeded at once to reduce the strength of the standing Army from over 80,000 men to about 10,000. In this disbandment disappeared many regiments which had fought well. The officers of the disbanded regiments were, as a rule, placed on half-pay. At the end of 1698 the Army was further reduced to 7,000 men.

There are some references among the State Papers of the reign referring to the hospitals during the war in Flanders. In September, 1691, the Paymaster-General of the Forces was authorized "to pay to the respective Colonels or Colonels-in-Chief of the various regiments in Flanders two 'stivers' *per diem* over and above each private soldier's allowance, upon the establishment for

every soldier that has been sent sick or disabled out of the said regiments into hospital since the 20th May last." A marginal note runs: "2d. a day extraordinary for each sick soldier." Later, in the same month, the Prince of Waldeck wrote to King William from Flanders: "There is much illness among the troops, 700 English are ill; I have written to Brussels requesting that they may be put in the hospitals in their garrisons." (Cal. S. P. Dom., 1691.)

During the war in Flanders the contractor to the hospitals was one Patrick Lamb, and some interesting sidelights are thrown on the medical history of the campaign by some papers, preserved at the Public Record Office, dealing with his services.

A Full State of the Hospitalls in Flanders dureing the Campaigne of 1695. Delivered in by Mr. Lambe, Contractor for victualling the Hospitalls.

Hospitalls	Number of men Received into the Hospitalls./—	Number of Dayes Continued in the Hospitalls./-	Charge att 9 Stivers and an Orky a Day each man, whereof the Soldiers pay 5 Stiv^{rs} and the King 4 Stiv^{rs} and Orky	Extraordinary charge for Blanketts, Sheetes, and other Bedding, Wine and Brandy, &c., Disburst by the Comptrollers and Clerks.
At Ghent	3351	125884	f58221:07	f17889:14
Dixmuyde	1061	25597	f11838:12¼	f 4019:00
Bruges	985	3437	f 1589:12¼	f 1375:13
Bruxells	2800	42344	f19584:02	f 5441:10
Namure	2087	8007	f 3703:04¾	f 6006:18
Liege	3232	84369	f39020:13¼	f26034:02
	13516	289638	f133957:11½	f60766:07

According to which account the whole Charge amounts to f194,723:18½
Whereof the King being repayed by the five Stivers a day from the Solddiers .. .. f 72,409:10

The Charge to his Ma^{tie} will be .. f122,314:08½

The Charge to his Ma^{tie} this yeare onely exceeds the Last by .. f 16,241:06

Memorand^{m}:
O^{f} the above Number of 13516 men Received into the Hospitalls this yeare, the whole of those that Dyed, does not exceed 910 men out of which their Dyed 217 men of their wounds.

On February 27, 1694-5, Patrick Lamb wrote to the Lords of the Treasury, stating that he had laid before their Lordships the reasons for praying a further allowance of half a stiver a man per day, for victualling and taking care of the soldiers in the hospitals

in the Low Countries, during the next campaign; praying their Lordships' intercession with the King for the augmentation at least to a farthing a day, as he understood the King was not inclined to grant the larger allowance. This letter is minuted "to have 9 styvers and ¼ of a styver," and docquetted "Mr. Lamb's proposalls for victualling the hospitalls for the yeare 1695." It states that provisions in Flanders grew dearer every year, and servants refused to serve him at the low rates he could afford in the last campaign. The nurses cost him £1,500 sterling. He prayed for an advance of halfpenny a man per day, and for the balance of his accounts.

The copy of a document in the State Paper Office (printed on p. 101) is very interesting, and explains itself.

This document is valuable, for it tells us there were six large hospitals in existence in the field of operations during 1695. Each patient was nearly twenty-one and a half days under treatment. The soldier's hospital stoppage was 5d. a day.

Parliament voted £25,000 "for the hospitals in Flanders," for this year, and the arrears "unpaid and payable" for the previous year for "Physick for the Army and Hospitalls" was £4,000. The total vote for the army of 87,702 men was two and a half millions.

Among the Treasury records is the account of Mr. Lamb, "relating to the hospitals in the Low Countries during the last campaign." It is dated January 1, 1696-7, and the charge amounts to £22,304 10s. 1½d.

Monthly "states" were furnished to the King. One dated September 4, 1695, gives the following figures for twenty-eight British regiments in Flanders:—

"Malades au camp	282
" dans l'hôpital	3,005
Capable de service	14,446
Effectives	18,722
Perdu ou en prison	73
Morts	11
Desertée	8"

(The figures for a month later were, respectively, 169, 2,889, 13,765, 17,887, 51, 18, and 3.)

In June, 1696, Mr. Lamb again petitioned the Treasury for £16,000 on account of services, writing from the Camp at Mariekirk that the "English hospitals in those parts were reduced to the greatest straits." In August, the King ordered £4,000 to be issued in tallies to the order of Mr. Lamb, "the officers of the hospitals having had no moneys since the two months' advance to them in

England." The officers of the hospitals appear to have had at this time great difficulty in getting paid; we have already noted that Sir Patrick Dun and others were petitioning for their pay during the Irish war fifteen years after that war had terminated. The soldiers' pay was often months in arrears, and it is on record that a detachment in the West Indies had received no pay for seven years. The regimental surgeons also suffered at times from the dilatory way in which the Government paid its just debts. In July, 1691, the petition of Theophilus Allen, Surgeon, was referred to the Treasury. Allen had disbursed £80 8s. for medicaments for Colonel Luttrell's and for Sir John Guise's regiments for the use of the soldiers. His petition states that he was a poor French Protestant who had been twenty months soliciting payment.

With regard to the supply of drugs and medicines during the later years of the war in Flanders, there are some papers in the Record Office which show the cost to have been about £5,000 a year. In March, 1697, Isaac Teale, Jonathan Leigh, Robert Gower, Edward Harle, and James Anderson, apothecaries, applied for the payment of £5,888 2s. 2d. due for drugs and medicines supplied to the Army and hospitals in Flanders in the year 1696. Their claim is minuted: "My Lords allow only the sum of £4,836 12s. 5d., and disallow the rest." In December, 1698, Isaac Teale and other apothecaries put in a claim for £5,348 13s. 10d. for drugs and medicines for the Army and hospitals in Flanders in the year 1697. They had provided "a magazine of drugs and medicines, and ninety-five pairs of regimental chests for the use of the hospitals and forces in Flanders, to be subject, as to goodness and prices, to the examination of Dr. Hutton, Dr. Lawrence, Sir Thomas Millington, Dr. Harald, Mr. Van Loon, and Mr. Rottermont. They were paid £5,321 10s. 1d."

In 1694 there were 1,840 officers and men in the West Indies, 8,410 in Ireland, 3,598 in Scotland, 17,393 in England, and nearly 57,000 in Flanders. Some Dutch and Danish troops in English pay are included in these figures.

The colonial stations for British troops at this time were New York, Jamaica, and the Leeward Islands.

There were only two companies of infantry in New York in 1690. A warrant for the payment of the officers on the staff of the garrison companies at New York in April of this year shows that a chaplain received 6s. 8d. a day, a chirurgeon 2s. 6d., and two matrons 2s. a day each. There was also a physician, named Thomas Thornhill, there, who applied through his colonel for a chest of medicines for

the troops. (Thornhill was appointed surgeon June 14, 1610.) In November, 1690, by order of the King in Council, "£10 additional" was directed to be given to the surgeon of the transport carrying troops to New York. (Cal. S. P. Colonial.)

In November, 1701, Phil. Rokeby was commissioned surgeon to the four Independent Companies of Foot in New York. On December 25, 1707, Phil. Rokeby became third Lieutenant to Viscount Cornbury's Fusilier Company in New York.

In the West Indies the garrisons consisted only of a few companies until 1694, when more troops were sent to Jamaica. On September 26, 1694, John Porrey, Clerk to the Plantation Office, wrote to the King's Physicians desiring them "to report what medicines will be needed for the troops in their passage to Jamaica; and afterwards to inspect the said medicines, and to recommend a physician for the expedition at £365 *per annum*, an apothecary at £200, and an apothecary's mate at £50." On October 6 the estimate, signed by Jo. Hutton and Tho. Millington, was submitted. The estimated "cost of physic, drugs, and utensils for 1,600 men on the voyage to Jamaica" was £200. "Estimate for twelve months for the same number ashore, £600." On October 19 the King's Physicians, Jo. Hutton, Tho. Millington, Ch. Harrel, and Ch. Fraiser gave a certificate passing the medicines for the Jamaica Expedition after inspection, and recommended Dr. William Fleming to be physician, and Mr. William Mortimer to be Apothecary to the Forces. A further certificate was given that "John Cliffe is qualified to be apothecary's mate for the Jamaica Expedition." These three gentlemen received their commissions accordingly on October 30, 1694, and soon afterwards petitioned for an advance of four months' pay. (Cal. S. P. Colonial.)

In October, 1694, Queen Mary raised an artillery train for the West Indies. It consisted of a first and second engineer, a fireworker, a master gunner, twelve gunners, six bombardiers, six miners, and four carpenters. Nat. Cooker, with pay at 4s. a day, was chirurgeon to this train. Colonel Luke Lillington's Regiment of Foot went on this expedition. Its chirurgeon was Samuel Hutchinson. In the winter of 1697-8 this regiment was disbanded, having almost disappeared from sickness and other causes.

Other regiments which served and suffered great loss in the West Indies during the reign were: Brigadier-General Thos. Erle's Regiment of Foot (Surgeons Benjamin Malfaquerat and Peter Toussaint), and Viscount Charlemont's Regiment (36th Foot) (of which Laurence Boudet was Surgeon).

In addition to providing artillery trains for the land forces, the Master General of the Ordnance also furnished trains for sea service in connexion with the bombardment of ports and the landing of troops. Thus a "Train of Brass Ordnance for Sea Service" was fitted out in 1693. The Surgeons were: Jno Bamber, Fras. Tomkies (2nd), Will. Skeat (3rd). It is noted in the Ordnance Warrants that in the following year, 1694, amongst the "Officers appointed for the Bomb and Machine vessels" were Fras. Tomkies, Surgeon, and his mate, Chas. Tomkies, with pay 17s. 6d. *per diem* the two. These took part in the expedition against Brest, the bombardment of Dieppe and Havre, the unsuccessful attack upon Dunkirk, and also accompanied the fleet which blockaded Toulon and Marseilles in 1695.

We may note also that in 1696 there was in Piedmont a "Compagnie de Canoniers et Bombardiers Anglois" which had a "Sirrurgien," Antoine Moitié, with pay "2 sch. 6 sols. par jour."

In 1699 the artillery trains were placed on a reduced peace establishment with, apparently, no surgeons. Surgeons to the Artillery were appointed by the Master General of the Ordnance, and their commissions were not at this time signed by the King.

It was not unusual at this time for an officer of high rank to take with him on active service his own private medical attendant. An interesting instance may be mentioned. During the siege of Namur the celebrated physician, John Radcliffe, attended the Earl of Albemarle. For his services he received 400 guineas and a diamond ring, 1,200 guineas from the Treasury, and an offer of a baronetcy from the King. The writer can find no record of any commission being issued to Radcliffe, but the payment by the Treasury gives rise to the conjecture that he was employed in a wider capacity than that of personal physician to the Earl of Albemarle, and was, in fact, during that campaign an army medical officer. Generous in life, after he had died, "a victim to the ingratitude of a thankless world, and the fury of the gout," he liberally endowed the University of Oxford with the funds from which have proceeded the Radcliffe Library, the Radcliffe Infirmary, the Radcliffe Observatory, and the Radcliffe Travelling Fellowships.

There was a good deal of invaliding from the seat of war. The invalids were collected into invalid companies which existed in London, Tynemouth, Windsor and Chester. Many of these men

had served from twenty to thirty years as soldiers and most of them had been disabled by wounds. Towards the close of the reign it was proposed to discharge those unfit to pension and return the others to the colours.

During the reign of King William III the following surgeons and physicians were appointed to garrisons for duty:—

Portsmouth: Jas. Wollock, Surgeon, January 1, 1690; William Smith, M.D., Physician, November 12, 1694. Hull: Benjamin Warde, Surgeon, August 1, 1690. Isle of Wight: Dr. Wm. Loving, Physician and Surgeon, June 1, 1698. Fort William: James Mortoun, Surgeon, December 31, 1692. Berwick-on-Tweed: Latimer Ridley, Surgeon, January 17, 1699; Wm. Cooper, Surgeon, October 30, 1699. The Tower of London: Thos. Blake, Surgeon, November 28, 1694; George Pool, Surgeon, November 1, 1693; Gideon Harvey, M.D., Physician, February 1, 1702. The dates are the dates of their Commissions. Of these, Gideon Harvey was the son of Gideon Harvey, a physician to the Army, who served in Flanders in 1659, became Physician to the Tower in 1689, and was a medical writer of some repute. The son was M.D. Leyden, 1690; M.D. Cambridge, 1698; Fellow, College of Physicians, London, 1703. He was Physician to the Tower till his death in 1754.

With regard to recruiting at this period, there was no limit of age and no standard of physical fitness other than height. We wonder what would be said at the present day of a soldier answering to the description of a deserter in James II's reign: "With six toes on the left foot, on his left hand two fingers growing together, the little toe of his left foot always sticking out of his shoe."

There were no barracks in England at this date. The soldier was billeted upon the people. In the summer, camps were often formed, and the men went under canvas. Water-bottles were first issued to the troops during King William's reign.

With regard to the pay of the army medical officer, and of others employed in military hospitals, the following table shows the rates of pay in 1690:—

	Pay *per diem.*
Physician-General	20s.
Chirurgeon-General	20s.
Apothecary-General	10s.
Governor of a Hospital	10s. 11½d.
Master-Surgeon	10s.
Garrison Surgeon	7s.
Garrison Physician	7s. 6d.
Surgeon's Mate (to a Hospital)	3s.

	Pay *per diem.*
Purveyor	6s.
Clerk of Hospital Accounts	5s.
Clerk of Hospital Furniture	4s.
Hospital Steward	3s.
Hospital Cook	3s.
Nurse Tender	2s. 6d.
In Regiments—	
Regiments of Horse and Dragoons, Surgeon	6s. includes horse.
,, Foot, Surgeon	4s.
Surgeon's mate	2s. 6d.
Life Guards, Surgeon	6s. and 2s. for horse.

It may be noted that the purchasing value of money at this date was about four times that of money now. In a regiment of foot or of dragoons the surgeon drew the same pay as a lieutenant.

It occasionally happened that an army medical officer drew pay both as a physician and as a surgeon separately. The hospital accounts for Flanders in 1692 give an instance of this.

The writer has been able to trace the commission of over 150 army medical officers during the period with which this paper deals, but the list is of little general interest, and therefore not given here.

The reign of King William III should be regarded as the period of "licking into shape" of the standing Army; it was during the troubles of this reign that was trained the splendid and efficient army which won such renown during Marlborough's campaigns when Anne was Queen.

Authorities.—The above paper has been compiled largely from original records preserved in the British Museum and Public Record Office. The Calendars of State Papers, Domestic, Colonial, and Treasury, have also proved very useful, and help has been derived from Clifford Walton's "History of the British Standing Army," D'Alton's "King James II's Irish Army List," Story's "Impartial History of the Wars of Ireland," Gore's "Our Services under the Crown," Fortescue's "History of the British Army," Gleig's "Military History," Cooper-King's "The Story of the British Army," Lord Wolseley's "Life of Marlborough," Macaulay's "History of England," Bright's "History of England" and the "Dictionary of National Biography." *The Dublin Quarterly Journal of Medical Science,* 1846 and 1866, and Cameron's "History of the College of Surgeons in Dublin" were also consulted for details of the history of Dun, Mosse and Proby. I did not see, unfortunately, that mine of information, Dalton's "English Army Lists and Commission Registers," until this article was nearly completed.

Reviews.

THE MENTAL SYMPTOMS OF BRAIN DISEASE: AN AID TO THE SURGICAL TREATMENT OF INSANITY DUE TO INJURY, HÆMORRHAGE, TUMOURS, AND OTHER CIRCUMSCRIBED LESIONS OF THE BRAIN. London: Rebman, Ltd., 1910. By Bernard Hollander, M.D. Pp. xviii. and 237. Price 6s. net.

The author describes his book as a collection of the clinical records of the mental symptoms of localized brain lesions and claims that it should be of assistance to those who have to treat cases of insanity due to focal lesions.

He associates lesions of the frontal lobes with simple mania and insanity in which disorder of the intellect is the prominent feature, of the parietal lobes with melancholia, of the middle temporal lobes with irascible insanity and *mania furiosa*, of the upper posterior temporal region with insanity in which delusions of persecution are the leading characteristic and of the cerebellum with insanity marked by excess or perversion of the sexual instinct. He cites a large number of cases, many of them very ancient history, in support of his views.

He admits that melancholia is sometimes found associated with focal lesions of the frontal lobes and explains its occurrence on these occasions on the grounds that the frontal lobes being the centres for the intellectual faculties are, as such, centres for the control and inhibition of the emotions.

He goes on to say: "In a lesion of the frontal lobes, therefore, the control of inhibitory influence exercisable over the emotions would be lost, and thus naturally active dispositions become morbid." This presumably means that a person of a naturally melancholic temperament may develop melancholia as the result of a focal lesion in the frontal lobes. If this is so, why should not a naturally irascible individual develop irascible insanity, or one in whom the *libido sexualis* is naturally strong become a satyriacal maniac as the result of the lesion of the frontal lobes instead of these conditions being due, as the author holds, to lesions of the temporal lobes and cerebellum respectively. He would be a bold man who would proceed to treat insanity by surgical interference based on the data contained in this book.

A. K.

ORGANIZATION, ADMINISTRATION AND EQUIPMENT MADE EASY. By Lieutenant-Colonel S. G. Banning. Aldershot: Gale and Polden, Limited. 1911. Eleventh Edition. Pp. xi. and 206. Price 4s. 6d. net.

A very useful addition to the library of any one taking up subject (*d*) (Organization and Equipment). It contains in a very small space a vast amount of information on a subject which must otherwise be obtained from a large number of official works, many of them difficult of access. References are given throughout to the official authority from which the information is derived. The absence of an index is to be regretted, also the fact that a large bulk of the volume has been devoted to advertisements.

G. G. D.

MANUAL OF SURGERY. By Alexis Thomson, F.R.C.S.Ed., and Alexander Miles, F.R.C.S.Ed. Third Edition. Vol. i., pp. xiv. and 861. Price 10s. 6d.: Vol. 2, pp. xx. and 886. Price 10s. 6d. 566 illustrations. London: Henry Frowde and Hodder and Stoughton, 1909.

This well-known manual is one of the best of its class. It is very complete, and has been brought well up to date in all respects. The division into two volumes makes for convenience and handiness, vol. i. dealing with general surgery, while regional surgery is treated of in vol. ii. While it follows the general lines of students' text-books, it has several special features, one of the most useful of which is the short summary of surgical anatomy prefixed to each chapter on the diseases or injuries of any particular region. There is also a useful chapter on the surgery of individual nerves. The illustrations are numerous and excellent, and both volumes are well indexed. The work can be recommended to our readers. C. G. S.

LEÇONS DE CHIRURGIE DE GUERRE. Par J. L. Reverdin, Professeur à la Faculté de Médecine de Genève. Paris: Felix Alcan. 1910. Pp. xi. and 224. 7 plates. Price Fr. 7·50.

In these admirably clear and interesting lectures a very complete account is given of the nature and mode of production of gunshot wounds. The opinions advanced are those held by the majority of military surgeons, and there is little to criticize, except that perhaps rather too much attention is given to matters of merely historical interest. Little is said about treatment, only a few pages at the end of the book being given to the subject of the first dressing and the work of the various medical units; even this is merely outlined, no details are given. The illustrations are all from photographs and are very good, though few. C. G. S.

ON WRITING THESES FOR M.B. AND M.D. DEGREES. By H. D. Rolleston, M.D., F.R.C.P., Senior Physician to St. George's Hospital. John Bale, Sons and Danielsson, Limited. 1911. Pp. 27. Price 1s. net.

This little book, which originally appeared in the *St. George's Hospital Gazette*, is reprinted on the suggestion of Sir Clifford Allbutt, with whose larger work on the same subject, "Notes on the Composition of Scientific Papers," Dr. Rolleston remarks that every candidate for a Cambridge medical degree should be familiar. The author tells us that these theses for degrees grew out of the intellectual exercise of public disputation, which was formally initiated by St. Bonaventure, Superior of the Franciscan Order, in the thirteenth century, to test the progress made by students, and to control the instruction given by teachers. From 1323 onwards, these disputations, which did not exactly correspond with the modern theses, formed part of the obligations for the degree of Magister Artium at the Sorbonne. Incidentally, he mentions that the degree of Doctor of Medicine was first conferred in this country by the University of Oxford in 1449, on one Thomas Edmonds; before that date the title Master of Physic was used. He then gives many valuable hints as to how to find a subject for a thesis, and what title to give to it. He explains what a thesis should be, and how the subject should be worked up and arranged. Lastly, he recommends that before sitting down to write one it is a good plan to attune one's literary style by reading a few pages of some really good prose, preferably not on medical

subjects. He adds that Sir Clifford Allbutt offers many models, such as John Morley, George Trevelyan, Hardy, Barrie and, among medical writers, Sir Thomas Watson and Sir James Paget. To these the author adds W. H. Dickenson and Gee.

Though this little book is intended primarily for those who are faced with the task of writing a thesis, it contains many useful suggestions for all who may have to compose a medical, or other paper; together with references to other works where such composition is dealt with in more detail. Many of us who are not practical writers would, from time to time, be glad to record our views on various matters in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, but hesitate to do so from lack of experience in setting them forth. To such this little book should be of use.

J. T. C.

Current Literature.

Prevention of Pernicious Attacks in Malaria.—W. M. James (Ancon), in the *Journal of Tropical Medicine and Hygiene*, No. 21, vol. xiv., November 1, 1911, discusses the prevention of pernicious symptoms in æstivo-autumnal infections. He states that pernicious symptoms seldom develop unless there is a notable increase in the parasites in the peripheral circulation. The presence of many young forms, malignant rosettes and multiple infections of red cells, he looks on as certain forewarnings of a pernicious attack, the danger point being reached if more than 4 per cent of the red cells are infected, and especially if more than 5 per cent of the infected corpuscles have more than one parasite in them. Early and vigorous treatment is necessary when these conditions are present, to prevent the blocking of cerebral capillaries by infected erythrocytes, and to prevent the simultaneous sporulation of a large number of parasites. Quinine, providing it is absorbed in sufficient quantity, can do this by preventing blocking of capillaries and by prolonging the duration of sporulation, so that instead of occurring *en masse* it is spread over two or three days. He quotes at length the conclusions of MacGilchrist, which went to show that quinine given hypodermically in the usual dilutions, was absorbed even more slowly than when given by the mouth, and that absorption from the stomach and bowels was much interfered with whenever there was gastro-intestinal disturbance, as so often happens in severe malaria. MacGilchrist recommended the intravenous injection of quinine in dilutions of not less than 1 in 150 in saline as the ideal treatment for cases of emergency. The author takes exception to MacGilchrist's statement, that quinine in high dilution is unfitted for hypodermic administration and he has, as a matter of fact, used this method as a preventive of pernicious attacks in twelve cases where the conditions threatening it were present. He used doses of 30 to 45 gr. in dilutions of 1 in 50 upwards and, in addition in most cases gave quinine by the mouth. The routine apparently settled down into the hypodermic injection of 30 gr. of quinine in 10 oz. of saline (1 in 160), followed by doses of 15 gr. thrice daily by the mouth. He gives details of a number of the cases, although these are not enough to base definite conclusions upon, Dr.

James is evidently impressed with the results, and his conclusion is that the hypodermic administration of quinine in high dilutions (1 in 150) in saline is practical and rational.

W. S. H.

Amœbic Dysentery.—Deeks and Shaw (in the *New Orleans Medical and Surgical Journal*, July, 1911, vol. 64), describe their treatment for amœbic dysentery, which consists of absolute rest in bed, strict milk diet, saline or water lavage of the colon one to three times a day, and large doses of bismuth subnitrate, a heaped teaspoonful (180 gr. *circ.*), every three hours night and day until the stools have diminished in frequency, and the tongue has cleaned, it can then be reduced to a dose three or four times a day. The milk diet and rest are kept up till there is only one stool in twenty-four to forty-eight hours, the tongue is clean, tenderness has disappeared from the colon and the skin has recovered its tonicity. Plain fruit juice may be given once or twice a day in place of milk. At first the bismuth is passed blackened with the hydrogen sulphide of the bowel, later as the bowel cleans, it is passed white; this the authors take as evidence of suppression of putrefactive bacteria in the bowel. They have had four cases of alarming symptoms following the ingestion of the subnitrate, but all of them cleared up with the use of magnesium sulphate. Amœbæ disappear from the stools in about four days, the average length of treatment is two to three weeks. In desperate cases an open cæcostomy is advocated with lavage of the colon. The authors speak scornfully of treatment by ipecacuanha, which they confess they have never tried; their objections are based on the idea that we know nothing of the physiological action of ipecacuanha in dysentery; this objection, however, might be equally well applied to the use of quinine in malaria. The authors talk of the salol coated pills being frequently passed unchanged, which is not flattering to the pharmacists with whom they have been associated. It is an essential of ipecacuanha treatment that the pills should be freshly made of the unsophisticated drug; evidence that the pills are broken up and absorbed is furnished by the sensations of the patient. Those of us who have had experience of the use of ipecacuanha in adequate doses and properly prepared, have a firm foundation for our faith in its efficacy, not only in amœbic colitis but in the pre-suppurative stage of amœbic hepatitis and as a means of checking the exhausting drain of discharge which sometimes follow the opening of a liver abscess. Nevertheless, we welcome any addition to our armamentarium in the treatment of disease and the treatment recommended by Drs. Deeks and Shaw will find a place when, for some reason or other, ipecacuanha is contra-indicated or when the patient fails to establish the usual tolerance to this drug. W. S. H.

Yellow Fever.—Seidelin, in the *Yellow Fever Bulletin*, vol. i, No 5, has an article on the post-mortem appearances of yellow fever. He attributes special importance to the jaundiced condition of the body and the yellow staining of the fat and serous surfaces; the mucosa of the mouth and pharynx are covered with blood, which often oozes out of the nostrils. The stomach contains either altered blood varying, according to the quantity, from a tar-like material to small black flakes floating in clear mucus, but occasionally cases are found in which no blood is

present in the stomach post-mortem. The mucous membrane of the stomach is congested and shows petechial patches, except where the patient has died very late in the disease. The changes in the liver are the most constant and "the most typical post-mortem findings." This organ may be uniformly yellow but more frequently it shows an irregular distribution of yellow patches on a dark purple ground, the consistence is diminished and the organ may pit on pressure. When cut with a dry knife, fat is often deposited on the blade, the amount of fat in the organ may be so great that fragments of it may float in water. "If both the typical hepatic lesion and hæmorrhagic gastritis are present the diagnosis may be considered established." "Microscopically the most constant feature is the fatty metamorphosis which is found more or less developed in all livers." The pancreas shows similar alterations to those found in the liver. The kidneys are usually congested and when cut show hyperæmia of the bases of the pyramids, while the apices are yellow. Microscopically, as in the liver, the principal change in the kidney is a fatty degeneration. It is, however, very irregularly distributed and affects principally the parts which appear yellow on naked-eye examination; small hæmorrhages are common. The spleen is not markedly affected, any considerable enlargement being an indication of coincident disease. The author concludes with an account of the differential post-mortem diagnosis from malaria, acute yellow atrophy, phosphorus poisoning and other diseases which might be confounded, clinically or at the autopsy, with yellow fever.

W. S. H.

No More Army Typhoid (Extract from the *Army and Navy Journal*, August 12, 1911).—"The rapid advance in Army camp sanitation, and the value of vaccination, are strikingly set forth by a comparison of the typhoid incidence of the manœuvre camp with that of the 2nd Division, 7th Army Corps, which was organized in Jacksonville, Fla., and remained there until October, 1898, some of the regiments leaving camp in September. This division was not conspicuously fortunate in its typhoid record for the Spanish-American War, and is selected because of the close similarity of its conditions of service to those of the Manœuvre Division. The two divisions were located in nearly the same latitude and for about the same length of time, and each had a good site and an artesian water supply of unimpeachable purity. While the period in camp of the 2nd Division, 7th Corps, was later in the year, the number of men involved is larger for the Manœuvre Division.

"While there were no deaths in the Manœuvre Division from typhoid, 248 were reported in the Jacksonville Division. Only one case of sickness from typhoid fever was reported in the Manœuvre Division, and that was a private of the Hospital Corps, who had not completed his immunization, having taken only two doses. This case was such a mild one that really the Manœuvre Division should be given a clear record. In the Jacksonville Division 2,693 typhoid cases were reported, which was an excellent record for the Spanish-American War.

"At the time that the manœuvre camp was being kept free from typhoid fever, forty-nine cases, with nineteen deaths, were reported as occurring in the city of San Antonio. It is doubtful whether this record has ever been equalled in any army or any city of over 12,000.

"The following tables give the comparison in detail:—

1898.—Table showing, for the Regiments of the Second Division of the 7th Army Corps assembled at Jacksonville, Fla., the Mortality and Morbidity from Typhoid Fever.

Regiments	Mean strength	Cases of Typhoid Fever		Deaths from typhoid fever	Deaths from all diseases
		Certain	Certain and probable		
2nd Illinois	1,095	253	341	18	22
1st North Carolina ..	1,164	147	227	16	20
2nd New Jersey ..	1,153	185	318	29	32
1st Wisconsin	1,232	209	311	46	48
50th Iowa	1,097	164	253	33	33
9th Illinois	1,288	153	248	18	28
2nd Virginia	1,220	105	152	17	20
4th Virginia	1,274	135	231	21	28
49th Iowa	1,236	378	612	50	50
Total ..	10,759	1,729	2,693	248	281

1911.—Table showing, for the Organizations composing the Manœuvre Division at San Antonio, Texas, the Morbidity and Mortality from Typhoid Fever (March 10 to July 10, 1911).

Organization	Mean strength. June	Cases of typhoid fever	Deaths from typhoid fever	Deaths from all diseases
11th Infantry	924	..	..	2
15th Infantry	969	..	..	..
18th Infantry	1,022	..	..	..
13th Infantry	929	..	..	1
22nd Infantry	1,033	..	..	..
10th Infantry	1,016	..	..	..
17th Infantry	953	..	..	2
28th Infantry	950	..	..	1
3rd Field Artillery	847	..	..	1
4th Field Artillery	741	..	..	..
Engineer Battalion	536	..	..	..
Signal Corps	197	..	..	3
9th Cavalry	743	..	..	1
11th Cavalry	1,143	..	..	..
Sanitary Troops	606	1	..	..
Total	12,659	1	0	11

"Sanitarians of the United States Army, who obtained these splendid results during the Texas manœuvres, will be interested in a health record just announced in the French army. General McCoskry Butt, N.G., New York, now in Paris, informs us that, between April 21 and June 25, of the 13,000 men campaigning in Eastern Morocco not one died of disease, and that, too, although the temperature was exceedingly high, the morbidity was much below the normal. Dr. Béchard, Director of the Service of Sanitation in the Oran Division, was greatly pleased by this wonderful showing. With Drs. Chantemesse and Vincent, Dr. Béchard has been interested in anti-typhoid vaccination tests in Morocco."

Mosquito Screening of Ships.—Melville-Davison, in the *Bulletin of the Yellow Fever Bureau* for October, 1911, discusses the difficult question of making ships mosquito-proof. The question is an important one to shipowners, as affecting quarantine and other regulations for protection against yellow fever. He holds that all schemes which aim at destroying the insects, rather than at preventing their entry, are to be condemned.

It was found by experience on the steamships of the Booth Line that sidelights could be screened by means of gauze of 14 by 14 mesh made of oxidized phosphor-bronze wire (26 s.w.g.), set in brass frames so that the ports could be shut with the screens in position. Skylights were generally screened by means of horizontal frames, carrying the same gauze, fixed below the openings.

The panels of existing doors were removed and wire gauze panels inserted, the wooden panels being used to protect the gauze when the screening was not in use and the doors were left open. All the doors were fitted with springs.

In this way it was possible to render the portions of the vessel occupied by passengers and crew mosquito-proof. The engine room, stokehold, and the kitchens cannot be treated in this way; it is found, however, that owing to the heat in these places screening is seldom necessary, and screens can be carried for use when the engines are cold or the kitchens out of use. Much more difficult is the question of the holds; they cannot be protected whilst cargo is being worked, and all gaseous insecticides damage the cargo. This problem remains unsolved.

C. H. S.

Kala azar and Fleas.—Professor U. Gabbi (*Malaria E. Malattie De Paesi Caldi*, No. 10, October, 1911) contributes a paper in which he describes a series of experiments to demonstrate that the fleas both of dog and man, after sucking the spleen juice obtained from heavily-infected patients, were not infected with kala azar.

Fleas found on the clothing of patients suffering from kala azar were never found to contain the *Leishmania donovani* body. Professor Gabbi concludes that this disease is not conveyed by means of fleas; his conclusions agree with those of Scordo and Franchini.

In a second paper Professor Gabbi calls attention to the annual recurrence of kala-azar in spring. The first cases occur in March, and reach a maximum in May; the incidence declines steadily up to November. Further observation is required to determine the annual incidence.

C. E. P.

The Examination of Sputum for Tubercle Bacilli.—Nemmser and Martos-Lissowska (*Deutsch. med. Woch.*, September 14, 1911, p. 1697) have tested many processes by which sputum may be liquefied and the bacilli precipitated. Their object was to find one which would dispense with the centrifuge and filter. They recommend the following methods :—

(1) Alkaline trypsin digestion. 0·1 cc. of trypsin and 5 cc. of 0·4 per cent sodium hydrate solution are added to 5 cc. of sputum. The mixture is shaken with the addition of a few drops of chloroform, and is incubated at 37° C. for twenty-four hours. There will then be, beneath clear supernatant liquid, a compact deposit, which can be readily removed and stained.

(2) Acid trypsin digestion, as above, except that 0·4 per cent HCl is substituted for the soda solution. There is no need to add chloroform.

(3) Oxidation. To 5 cc. of sputum, 5 to 10 drops of chloric acid—$HClO_4$—and 5 cc. of water are added, incubated, and treated as before. Instead of the chloric acid, 0·5 grm. of potassium chlorate and 5 cc. of 0·4 per cent HCl may be substituted.

The sediment obtained by the above methods is more abundant, and can be fixed to the slide more easily than that which is deposited by antiformin. The authors have found tubercle bacilli twenty-one times in 300 examinations of sputum by one or other of these processes, which would otherwise have escaped detection. C. B.

The Detection of the Typhoid Bacillus in Water.—Lemke (*Deutsch. med. Woch.*, September 14, 1911, p. 1698) bases his method on the fact that the typhoid bacillus is inhibited to a less degree by a strongly saline fluid than are water-bacteria.

He adds 3 to 5 per cent sodium chloride to peptone broth of + 10 to + 25 acidity to phenolphthalein. He prepares a watery solution of malachite-green mark Ia, 1 in 120; 0·2, 0·3, 0.5, 0·7, 1·0, 1·4 cc. of this are mixed with quantities of 100 cc. of the salt broth. 15 cc. of each are placed in tubes, which are then inoculated with the suspected water. He has recovered the typhoid bacillus in sixty experiments after artificially contaminating the water, in one instance when only two typhoid germs were introduced. C. B.

Pirquet's Reaction in Tuberculous Lesions.—Professor Wilms (*Deutsch. med. Woch.*, No. 36, 1911) discusses the value of Pirquet's reaction and comes to the following conclusions:—

(1) In fungoid forms of tuberculosis, i.e., in cases in which the tuberculous lesion consists largely of granulation tissue, Pirquet's reaction is, as a rule, negative, in spite of the presence of tubercle bacilli.

(2) The tuberculin treatment of tuberculosis is not advisable in cases which give a marked Pirquet's reaction, but should be reserved for those cases which only react feebly.

(3) The best results are obtained by treating tuberculous lesions with tuberculin and X-rays in addition to some form of sanatorium treatment.

(4) Our task is not merely to remove the tuberculous focus but to increase the resisting powers of the body. The surgical treatment of tuberculous foci will gradually be abandoned in favour of some procedure directed to increasing the patient's general resistance to the tubercle bacillus. Scrofulous glands in youth tend to build up the body's resistance to the tubercle bacillus, hence, unless suppuration occurs, these glands should not be removed by operation, as by doing so, we take away one of the main protective influences against the tubercle bacillus. C. E. P.

An Investigation into the Formation of Arsenic-resisting Spirochætes (*Deutsch. med. Woch.*, No. 39, 1911).—Rothermundt and Dale have published a series of experiments undertaken with the object of producing an arsenic-resisting strain of spirochætes. Hens were inoculated with fowl spirochætes; about two days later when spirochætes were plentiful in the circulating blood, a quantity of atoxyl equal to one-third of that required to destroy all the spirochætes was injected subcutaneously. After an interval of, roughly, two days, some of the blood was withdrawn and examined for spirochætes; another hen was then inoculated with this blood and treated with atoxyl as in the first case. After sixteen passages, when the spirochætes had been under the influence of

arsenic for two months, the dose of atoxyl which had been found sufficient to kill all the spirochætes at the beginning of the experiment was again tried. This was found to be quite as effective as in the original test. After twenty passages an injection of salvarsan was tried. This was equally effective.

The writers conclude that spirochætes do not acquire any resistance to arsenic as the result of repeated small doses, and that salvarsan may safely be used in this way in the treatment of syphilis. C. E. P.

Salvarsan (*Münch. med. Woch.*, October 17, 1911).—At the Annual German Medical Congress which was recently held at Karlsruhe, Ehrlich opened the discussion on salvarsan. He stated that this remedy had been administered on several hundred thousand occasions, and that with it cures had been effected in 90 per cent of patients suffering from early syphilis. The number of accidents which had followed its use was small. Hæmorrhagic encephalitis was the most frequent cause of death when it occurred; hence, in all affections of the cerebro-spinal system, it was advisable to proceed with caution and to begin with small doses, which may be repeated. Absolute rest and avoidance of excess of every kind must be enjoined.

Rigors, headache, fever, vomiting, and diarrhœa have been lessened by using only water which is germ-free in the preparation of the solution for intravenous injection. This method of administration has superseded all others.

It has been shown by animal experiments that a *Bacillus coli communis* infection increases the toxic action of salvarsan twofold. In advanced trypanosomiasis its toxicity is enhanced threehundredfold.

Ehrlich thinks that the ear-symptoms which sometimes arise three to five months after salvarsan, are not caused by it, since they disappear under further doses of the remedy. Moreover, Benario has collected records of 194 instances of such ailments after salvarsan, and 122 after mercury, from medical literature during the same period.

The success of the preparation in yaws has been remarkable. Three hundred and twenty-eight sufferers were cured in a fortnight in Surinam. Only three failures have been reported in 900 cases. In relapsing fever the spirilla are all destroyed six to eight hours after treatment. The same event occurs in the spirillum infection of birds. Salvarsan acts well in tertian ague. It exerts a favourable influence on bilharzia disease. Glanders in man and beast is cured by it. While it benefits Delhi boils, it has no remedial effect on kala azar. Unfortunately its use is of no avail in trypanosomiasis and sleeping sickness.

Wechselmann stated that he had seen no evil results after 8,000 injections of salvarsan, even when given in doses of 0·5 grm., repeated three times at three-day intervals. He insisted on the necessity of a bacteria-free water for dissolving the crystals. Neither heart nor nerve affections are absolute contra-indications. The prognosis of nervous sequelæ is favourable. He remarked that optic neuritis is not uncommon in early untreated syphilis.

Gennerich observed poisoning twice only in 1,500 injections. He has met with one case in which a relapse implicated the nervous system. He thinks that salvarsan combined with calomel injections will always effect a cure.

Meirowsky has noted anaphylactic symptoms twice, and cerebro-

spinal sequelæ once in the treatment of 500 patients. Intravenous injections of salvarsan and calomel intramuscularly abort primary syphilis.

Weintraud has given salvarsan in syphilitic disease of the heart and arteries. Provided that the doses were small, good resulted.

Starck has administered 0·5 to 0·6 grm. intravenously thrice within a fortnight. He has not met with a relapse involving the nervous system in 400 persons treated.

Pick deprecated the use of salvarsan in tabes.

Salomon has treated ten initial lesions; in nine with success.

Stern has been equally fortunate in cutting short the infection in nine out of eleven primary sores.

Kromayer recommended 0·2 grm. thrice weekly. In this way he has given as much as 5 grm. without evil consequences.

Arzt has noted temporary ear troubles once or twice, but never optic neuritis or other cranial lesion in 420 syphilitics to whom he had given salvarsan. No relapse occurred in 100 of these in whom mercury had been injected in addition.

Benario found that the nerve sequelæ recorded by numerous observers after salvarsan amounted in the mean to 0·9 per cent.

Grünfeld had nothing unfavourable to relate of his experience of intravenous injections in 600 cases.

Schreiber reported good results from intravenous administration of salvarsan in chorea, and in the human infection with the foot-and-mouth disease of animals. C. B.

The Effect of Salvarsan on the Nervous System.—Finger (*Wien med. Woch.*, October 14, 1911) discusses this subject at great length. He begins by pointing out that in many cases an injection of salvarsan is immediately followed by some unpleasant symptoms, e.g., rigors, pyrexia, giddiness, vomiting, &c. In a few cases an injection produces œdema and cyanosis of the face, partial loss of consciousness, vomiting, diarrhœa, dyspnœa, muscular spasms, and marked collapse. This condition Finger regards as due to acute arsenical poisoning, and refuses to accept Neisser's view that it is caused by the endotoxins of the spirochætes set free by the destruction of immense numbers of them. Finger also rejects Wechselmann's theory that these manifestations are caused by the dead bacteria in the transfused solution, as he says they appear after intramuscular injections when the fluid is extremely limited in quantity, and that no similar results are noticed when patients are transfused with plain saline solution, obtained from the same source and under the same conditions as that used for salvarsan infusions. Finger then criticizes the published statistics of nervous affections following the use of salvarsan, mainly because the patients have not been kept under regular observation after receiving the injection. Among his own cases, affections of the nervous system occurred most frequently during the fourth month, next to this during the fifth, and then during the eighth month from the commencement of the disease. Finger gives notes of a number of his cases to show the different lesions which may follow an injection of salvarsan.

These affections of the nervous system always appear during the sixth to eight week after the injection of salvarsan. Among patients treated with mercury a similar occurrence has not been observed. Even accepting Wechselmann's explanation that the lesions are due to the destruction

of foci of spirochætes, which would give rise to trouble at a later date, it is greatly to the patient's disadvantage that he should suffer from a serious nervous lesion at an early date instead of later on.

Among Finger's patients treated with salvarsan, affections of the nervous system appeared in 4 per cent of primary syphilis cases, 12 per cent of those in the secondary stage, and 2 per cent of those in the tertiary stage. He therefore concludes that salvarsan should not be used for the treatment of syphilis in the early secondary stage. C. E. P.

Treatment of Syphilis by Repeated Doses of Salvarsan (Kromayer, *Deutsch. med. Woch.*, No. 34, 1911).—Kromayer, after a long experience with Alt's, the paraffin emulsion and intravenous methods, takes exception to large single doses of salvarsan, and now advocates as a general rule a dose of 0·2 grm. injected intravenously three times a week. The total quantity he employs in each case has gradually risen from 1·2 grm. in the earlier cases to 3·6 in the later ones. The length of the course varies with the total quantity injected, from two to six weeks.

The intravenous method is employed for out-patients, the only special precaution taken being to send them straight home and to bed for the remainder of the day. In the later injections the reaction is usually absent. Different veins should be selected for each injection.

As regards permanency of cure, no definite statement can be made at present. Out of 365 cases treated with salvarsan, reliable information in regard to the recurrence of relapses was obtained from 138. The results were as follows:—

Of sixty patients treated with 0·6 to 1·1 grm. of salvarsan, but without mercury, 23 (= 39 per cent) had a relapse.

Of thirty-one patients treated with 0·5 to 1·1 grm. salvarsan, and also with mercury, 11 (= 35 per cent) had a relapse.

Of forty patients treated with 1·2 to 2·5 grm. salvarsan, but without mercury, 5 (= 12 per cent) had a relapse.

Of 7 patients treated with 1·5 to 2·5 grm. of salvarsan, and also with mercury, none had a relapse.

Of the later patients treated with more than 1·6 grm. of salvarsan none have had a relapse, although it must be remembered that these cases were treated in January to March of this year, and that, consequently, the interval since the treatment is a comparatively short one.

Seven patients treated in May, 1910, each with a single dose of 0·3 to 0·4 grm. of salvarsan, have all had relapses, in some of the cases very severe relapses.

Kromayer concludes that to be efficient a large dose of salvarsan up to 3·6 grm. must be employed, and that this should be administered in smaller single doses by intravenous injection during a period of several weeks. He also approves of the employment of mercury in addition to salvarsan. C. E. P.

Salvarsan in Kala Azar.—Christomanos (*Deutsch. med. Woch.*, September 14, 1911, p. 1705) reports four cases of kala azar treated with salvarsan: (1) girl, aged 18, weight 45 kg., splenic puncture positive, 0·3 grm. salvarsan was given intravenously and 0·4 grm. eight days afterwards. Death from hypostatic pneumonia eleven days later. Postmortem Leishman bodies numerous in spleen, liver, and bone marrow, which were normal in appearance. (2) Male, aged 30, weight 52 kg.,

diagnosis confirmed by puncture of spleen, 0·35 grm. salvarsan intravenously, followed by 0·4 grm. seven days later. No improvement. Condition remains unchanged six months after last injection. (3) Girl, aged 7, weight 16 kg., ill nineteen months, 0·15 grm. "606" intravenously. Eight days after this, many parasites were found in splenic puncture. Died in a short time. (4) Boy, aged 5, weight 12 kg. Diagnosis by splenic puncture, 0·12 grm. salvarsan intramuscularly. Died in a fortnight. Christomanos concludes that neither intravenous nor intramuscular injections of "606" in doses of 0·007 to 0·01 grm. per kg. of body weight exert any good effect in kala azar. Neither the number nor the staining properties of the Leishman bodies were altered. He quotes the two cases recorded by Nicolle, Cortesi and Levy which were also unsuccessful. C. B.

The Fate of Salvarsan in the Body.—Stumpke and Siegfried have carried out a long series of experiments to determine what happens to salvarsan when it is injected into the body. Most of the investigation was made with rabbits. Their general conclusions are: Immediately after the injection the bulk of the drug is taken up by the liver. The quantity of arsenic which can be recovered from the liver gradually decreases, but traces can be found for months. The other viscera also take up small quantities of arsenic and retain some of it for long periods. The kidneys appear to merely excrete the arsenic compounds, not to retain them. The heart and lungs were constantly found to contain arsenic. This might help to explain the occasional fatal results following an injection of salvarsan in cases of cardiac degeneration. Except for the first twenty-four hours after an injection, arsenic was practically never found in the circulatory blood. C. E. P.

Intensive Treatment of Syphilis by Mercury and Salvarsan.—Arning (*Deutsch. med. Woch.*, No. 39, 1911) describes his combined mercurial and salvarsan treatment of syphilis. As soon as a diagnosis of syphilis is made he begins a course of mercurial inunctions 4 to 6 grm. of mercurial ointment daily. On the first day of treatment Arning gives one injection of 0·6 grm. of salvarsan, made up with four drops of glycerine and 4 cc. of hot distilled water, deeply into the gluteal muscles. On the tenth day of treatment he gives an intravenous injection of salvarsan. The patients are mostly free from all signs of the disease on the sixteenth day of treatment and are discharged hospital to attend. Of 500 cases treated in this way he was able to trace seventy-one, none of whom showed any sign of relapse, and among them was one man who had received this treatment in November, 1910; he presented himself with a primary syphilitic sore in February, 1911. C. E. P.

Iodival in the Treatment of Syphilis.—Pohlman (*Berlin. klin. Woch.*, No. 43, 1911) has found that patients who are unable to take iodides of the alkalies can be given large doses of iodival without showing any signs of iodism. Iodival is an organic compound of iodine and is supposed to be specially effective in cases of syphilis affecting the nervous system. C. E. P.

"Mastisol" Dressing for Wounds.—Oberstabsarzt Dr. Mazel (*Militarärzt*, October 27, 1911), has a long article on the use of adhesive

substances in field surgery. He reviews v.Oettingen's experience in the Russo-Japanese War. V.Oettingen used a mixture of mastich 20 grm., chloroform 50 grm., linseed oil 20 drops. Painted on the unwashed skin surrounding a wound the chloroform evaporated and left an adhesive surface which not only served to keep the dressing in place, in many cases without the addition of a bandage, but the solution also fixed all the microbes in the skin and thus prevented the wound from becoming septic. Wounds rapidly dressed in this way healed up quickly. The chloroform did not always evaporate completely and in some cases led to the formation of blisters.

It is claimed that mastisol is superior to v.Oettingen's mixture and does not cause any irritation. It is a solution in benzol of mastich which has been previouslychemically treated. "Mastisol" is especially useful when extension of a limb is desired, as it is merely necessary to paint the solution on the skin, let it almost dry and then apply the strips from which the extension is to be taken. This obviates the necessity for adhesive plaster.

Dr. Börner (*Münch. med. Woch.*, No. 43, 1911) has an article based on his experience with this method.

He says that in the case of a wound no matter how dirty and septic the skin may be it is only necessary to paint on a layer of "mastisol" so as to cover every portion of the skin right up to the edges of the wound; this fixes all the germs in the skin and at the same time kills a large proportion of them. If there is much bleeding it should first be controlled by pressure with a plug of sterile gauze. The solution can be used on hairy surfaces as it fixes the hair to the skin. The layer of varnish left when the solution dries makes the skin waterproof so that it does not become sodden by a prolonged discharge, as in the case of an empyema.

To prepare the skin for an operation it is only necessary to paint it with a layer of "mastisol" and apply a sheet of sterile paper or gauze to protect the surgeon's hands.

When dressing a wound with "mastisol" it is painted over the adjacent skin and allowed to become nearly dry, which requires twenty to thirty seconds, a sterile dressing is then applied and pressed firmly on the surface. The sticky varnish holds the dressing firmly in position, without the aid of a bandage, this is a great advantage in wounds of the face, neck, head or buttocks.

This plan of treating wounds is rapid, effective, inexpensive and greatly reduces the paraphernalia required in surgery. V.Oettingen exhibited his "mastisol" solution dressings and bandages at the Surgical Congress, Berlin, 1911. They are now on sale to the public. C. E. P.

Wounds by Blank Cartridge.—Lefèvre (*Le Caducée*, October 7, 1911), in an article on this subject, quotes a case reported by Méd. Major Romieu, in which a soldier wishing to commit suicide placed the muzzle of his rifle firmly against his left temple and pulled the trigger. The whole skull was completely destroyed.

In Lefèvre's case, an Arab was accidentally shot in the left temple by a pistol loaded with powder only. When fired the muzzle was only 20 cm. (8 in.) from his head. He lost consciousness for an hour and there was profuse bleeding from the wound but none from the ears or nose. When seen fifteen hours after the accident he was conscious but

unable to speak; there was no paralysis or muscular spasm. There was a "T" shaped wound measuring 3 × 4 cm. This was opened up and the skull examined, but no trace of a fracture could be found. The aphasia persisted; on the third day right hemiplegia set in, breathing became stertorous and he died four days after the accident. A post-mortem examination was not permitted. C. E. P.

Bushmen's Poison for Arrow Heads.—Stabsarzt Trommsdorff (*Archiv f. Schiffs- und Tropen-hygiene,* Heft 19, Bd. xv, 1911), while on an expedition in the North-East part of German South-West Africa, was told by a native that the Kalahari bushmen in addition to vegetable juices also obtain a poison for their arrow heads from certain larvæ. By dint of bribery the native was persuaded to show Dr. Trommsdorff how the larvæ were obtained. The native took him to a large hole under a bush and in a few minutes dug up several brown sandy objects about the size of a hazel nut. When broken open each was found to contain a yellowish curved larva with two pairs of legs. Trommsdorff was not able to make any experiments at the time, but in November, 1910, he procured a further supply; these he made into an emulsion with salt solution and injected this into a number of animals.

The effect on dogs was to cause a localized œdema at the site of injection, acute inflammation of all internal organs, dyspnœa and death in sixteen to eighteen hours. The experiments are very fully reported. C. E. P.

Ristin, a New Remedy for Itch.—Tollens (*Deutsch. med. Woch.,* No. 44, 1911) has treated thirty cases of itch with ristin, which is the monobenzylester of ethyl-glycol, and gives a very favourable report. The remedy is supplied in solution, having the formula, ristin 10 grm., alcohol 25 grm., glycerine 5 grm.; the solution is clear, has a faint odour and is not sticky or greasy. The solution was thoroughly rubbed into each patient, three times in twenty-four hours; this requires from 100 to 150 grm. Next day the patient was ordered a lukewarm bath with a sparing use of soap.

The cure was in every case complete; the remedy did not give rise to irritation either at the time of its application or subsequently, in fact most patients experienced immediate relief from the itching due to the acarus. The clothes were not affected, and there was no appreciable odour from the drug. C. E. P.

Treatment of Urticaria.—Wolff (*Deutsch. med. Woch.,* No. 38, 1911) reports a case showing the value of quinine in acute urticaria.

In the case of a little girl, aged 6, he gave 1.5 gr. of quinine (the particular salt is not stated) three times a day after food. The effect was rapid and lasting. C. E. P.

Diet in Nephritis.—Kakowski (*Berlin. klin. Woch.* No. 43, 1911) describes very fully a series of observations on the effect of tomatoes as an article of diet for patients suffering from nephritis. Both fresh and preserved tomatoes were used and were made into soup. Kakowski concludes that tomatoes do not exercise any harmful influence on the course of the disease and may safely be ordered for cases of nephritis. C. E. P.

Correspondence.

DEFENCELESS POSITION OF TERRITORIAL MEDICAL UNITS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—I notice with interest Capt. Graham's criticisms of my letter *re* the defenceless position of Territorial Medical Units, but I am afraid I must still differ from him on certain points.

The argument that strikers would deal with the hooligan seems to me to be disproved by the recent occurrences at Liverpool and Llanelly, where wholesale pillaging went on; and as public sympathy is a very important thing in a strike, and where it is alienated the strike is bound to fail, why did not the strikers assist the police in suppressing the hooligan, instead of in many cases joining him? Also in the recent coal strike in Wales, some of the mobs which attacked mine property and the police certainly contained some strikers; at least, no strikers turned out to assist the police in defending property.

Again, military hospitals, whatever happens to anyone else, will certainly get what food there is, and people who are starving will not consider whether it is in the interest of the country that the wounded should have first claim, unless there is an armed personnel to support this argument. Hospital supplies were not easy to get in London during the recent strikes, although the inmates are drawn largely from the strikers' own class.

With regard to the field ambulances being immune on account of their proximity to rifle range; are these units always going to be so near rifle range? It seems to me that with the rapidity of movement of modern armies, especially after a successful engagement, some of these units, or certainly parts of them, may at times find themselves in very isolated positions, and therefore come under the class mentioned by Capt. Graham, i.e., voluntary aid detachments acting as clearing or stationary hospitals, which he admits might be attacked.

Lastly, I still maintain that a carbine and bayonet are preferable to a revolver; it is easier to use and certainly inflicts less severe injuries than a revolver.

I am, &c.,
GEORGE K. BIGGS,
Major, R.A.M.C. (T.F.).

November 24, 1911.

A QUESTION OF WORDS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—At the risk, perhaps, of being thought pedantic, I would call the attention of my brother officers and other readers of our Journal to the need of a little care and thought in the use of certain words which in the course of our daily official duties we have constantly to employ. The words to which I wish now especially to call attention, are anopheles

or anopheline, conservancy, sanitation, room and theatre. Of them I would make the following remarks.

Anopheles and *anopheline*, as signifying a particular kind of mosquito, are words in almost daily use by most of us, but invariably pronounced wrongly. The error lies in giving the "o" a short value instead of a long. In other words, the users of these terms forget that they are derived from the Greek, and that the "o" is an omega and not an omicron. The correct pronunciation of anopheles or anopheline is with the "o" long, that is, they should be pronounced anōphĕlēs or anōphĕ-line, not anŏphĕlēs or anŏphĕline. Curiously enough, the people who mispronounce these words as regards the "o" give the correct quantity to the two "e's" in anopheles, and the same letter in anopheline. That is, they recognize the first "e" to be an epsilon or short "e," and the second to be an eta or long "e," in the word anopheles, and always a short "e" in anopheline. I have heard a Frenchman ask one of our officers what was the word anŏphĕlēs that he was constantly using in a technical conversation between them on the malaria problem. It was not pleasant to hear the explanation and the naive confession of ignorance as to the correct etymology of the word used. Apart from this, to a man familiar with classical words, the constant use of a false quantity in the employment of a Greek or Latin word is as irritating and disturbing as the playing or singing of a false note is to a person with a musical ear. I trust it is not too late to secure a reasonable care in this matter, and that a correct pronunciation of classical quantities may be the rule and not the exception by men who profess to be educated.

Conservancy and *Sanitation*.—In respect of these two words, my criticism is not as to pronunciation but as to manner of using. Last week I had a long letter from one of our most able officers, telling me of what he had done in the way of bettering "sanitation" in his garrison. His letter bristled with the word "sanitation," but the subject-matter of his epistle was really nothing but an account of how he had secured an improved system of conservancy. His use of the word "sanitation" was typical of too many of our officers. He was confusing a detail or part with the whole. Who would think of describing a man as a good "drill," when he was capable only of doing the manual exercise correctly? Or who would say that a man was an excellent cavalry soldier just because he was good at keeping his horse well groomed and his saddle and bridle in good order? In both cases the manual exercise and the horse grooming or saddlery cleaning are but elementary details in the bigger rôle of being good "drills" or good "cavalry soldiers." So it is with conservancy and sanitation. The former word implies and is used to express the details involved in the removal of excreta. It is true this is an important detail in securing good health, but it is not sanitation. The word "sanitation" connotes everything which conduces to and promotes or engenders good health in a community. In that sense it

embraces both a theoretical and practical knowledge of some of the higher and technical sciences, such as bacteriology, sero-therapy, chemistry, physics, mathematics and medicine. No one can be said to be a sanitarian or capable of systematic and organized sanitary effort unless he has a working knowledge of all these sciences. On the other hand, a man with no knowledge of any of these technical sciences, but equipped only with a faculty to organize labour, and animated by a definite conception that dirt must be removed, can become an excellent scavenger or conservancy man.

Looking at it in this way, it appears to me that there is need for clear thinking on the part of many as to how they use the words "conservancy" and "sanitation." As officers of a presumably educated, scientific and technical corps, we are not called upon, and have no wish to carry out secondary or menial work such as that covered by the term conservancy; but we are concerned with and must ever play the dominant part in the multiplicity of activities indicated and covered by the term sanitation. Unless we think clearly and use language or words carefully in respect of these matters the risk is great of our slipping from the higher to the lower plane. We are taken largely at our own valuation in these things, and there is much to warrant the view that, as a corps, we have lost ground in lay opinion by a slipshod use of words which, employed logically and intelligently, should convey the true attitude which we claim to hold in respect of sanitary effort.

Now as to the words "room" and "theatre." These are in constant use by us in respect of surgical work. Too frequently we hear men talking about the "operating theatre" in our hospitals; what they mean really is the "operating room." A theatre implies a place where a show or entertainment is given, or, at least, a place so arranged that a number of onlookers can share in the enjoyment of certain proceedings. Now, the place where we should and do perform surgical operations can in no way be said to conform to either conception of what is a theatre. Apart from this illogical use of the word "theatre," the mere use of it in association with a highly important and technical procedure lowers us, and what we do, in the minds of an educated, thoughtful and critical public. Surely it is time to think clearly on this point, too, and to be careful of our words. We can speak and think of an operating room, but never of an operating theatre. The latter, apart from its unseemliness, suggests the student and the garish environment of the schools. These are not conditions either of personnel or place the self-respecting officer wishes to see perpetuated, or even indirectly associated with the daily work and duties of our Corps.

Pardon, Sir, the length of this letter, but I trust the attention now called to a mere question of words may arouse and stimulate some care as to details too much neglected. I am, &c.,

October 20, 1911. "SENIOR."

No. 2. February, 1912. Vol. XVIII.

J. T. Fotheringham
Lt Col
Toronto.

Journal
OF THE
Royal Army Medical Corps

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ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
OXFORD HOUSE,
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOLUME XVIII. FEBRUARY, 1912. No. 2.

Journal

of the

Royal Army Medical Corps.

Original Communications.

A CRITICAL REVIEW OF KALA AZAR AND TROPICAL SORE.[1]

By LIEUTENANT-COLONEL SIR WILLIAM B. LEISHMAN, F.R.S.
Royal Army Medical Corps.

(*Continued from p.* 20.)

III.—Tropical Sore. *L. tropica*, Wright.

SINCE the first observation of the presence of *Leishmania* parasites in a tropical sore by Wright, in 1903, a great number of accounts have appeared, confirming their presence in the tropical sores peculiar to particular countries or districts. Up to this time there was considerable doubt as to the identity of the various sores common in many parts of the Tropics, and this doubt is reflected in the innumerable synonyms by which the lesions are known. One after another these lesions were searched for the new parasites, and, practically without exception, they were readily detected. Without attempting to give a complete list of the various names, the following may be mentioned: Aleppo boil, Armenian boil, Persian boil, Delhi boil, Frontier sore, Bagdad sore, Biskra boil, Gafsa boil, Nile sore, and innumerable others. The more general terms of tropical sore, Oriental sore, and *bouton d'Orient* have also been freely employed by those who believed in their identity on clinical grounds. Of these general terms, the two latter are no longer appropriate, since the affection is now known to exist in the New World as well as in the Old, and even the term tropical sore, adopted in the present instance, is no longer strictly accurate,

[1] Reprinted by permission of the Editors of the *Quarterly Journal of Medicine.*

since their presence on the northern shores of the Mediterranean has been recognized.

Besides confirming the identity of the sores, so long familiar to tropical physicians in many parts of the world, the easy demonstration of the parasites has led to the detection of tropical sores in countries hitherto unsuspected. Of these, the following may be mentioned : *Asia*, Bettman and Wasielewski describe a case from Central Asia, and Nicolas thinks it is common in New Caledonia; Marzinowsky also reports more cases from Transcaucasia in addition to those in which he first identified the parasites, independently of Wright. In *Europe* chief interest attaches to the discovery of the existence of this form of Leishmaniosis on the Calabrian coast of Italy by Gabbi and Lacava, while Cardamitis and Melissidis have also found it in Crete, and Reinhardt in Constantinople. In *Africa* new foci have been demonstrated in Algiers and other parts of the northern coast, and at Zinder in Northern Nigeria, where Stevenel has shown it to be identical with the disease known locally as "Cro-Cro." Benoit-Gonin also speaks of it as common on the upper reaches of the Niger itself. *America*, too, has been shown to be no longer exempt, as has been believed for so long, and apparently cases are far from uncommon in several parts of Brazil and on the Amazon, as has been pointed out by Paranhos and Marques, Carini, Lindenberg and others. In this country the local name of "Bauru ulcer" appears to have been used for some time, and the majority of the cases have been found in the province of São Paulo. Trinidad and the Canal Zone of Panama have been found by Darling and Connor to harbour the disease, and there can be little doubt that further extensions will soon be made to the geographical limits of the American form. It has been suggested that the disease may have only been recently imported into Central and Southern America, and Carini and Paranhos mention that their first case was that of a Syrian who had recently come from Beirut, but at the same time they add that a similar type of sore has been known in Brazil at least since 1895.

Morphology of the Parasites.—If differences exist between *Leishmania tropica* and the other species they must be very slight, since the great majority of observers who have had the opportunity of comparing them are agreed that they are morphologically indistinguishable. The description of one holds good for the others. The few special points which may be noted are that Nattan-Larrier and Bussière have sometimes seen a delicate filament connecting

the blepharoplast and the nucleus which they do not think corresponds to the rhizoplast described by Novy in *L. infantum*, and by Christophers in *L. Donovani*. Several observers have studied the fresh parasites, and all are agreed that they show no motility. In most instances the parasites are intracellular, and only rare free forms are to be seen, but Cardimitis, in his study of the Cretan cases, found the reverse, namely, that they were almost all free and isolated, and only a few intracellular ; it may be noted that the sores he examined were not ulcerated. The size of the parasites in comparison with that of the other species has been the subject of some difference of opinion, some holding that they are larger on the average than those of the constitutional disease, and others that they are smaller. The point is not one of value in differential diagnosis, since it is abundantly clear that there are wide variations in this respect, even in single species, and that the size and shape may be influenced by the site, and probably also by the rapidity of growth and the stage of development. As far as the experience of the writer goes, he has found the parasites somewhat larger in tropical sore than in the other species, but he is not inclined to lay any stress on this.

Forms which apparently indicate a multiple division of the parasites have been described by Lindenberg and others, but Marzinowsky, from his observation of living specimens, does not agree with this, and considers they are due to compression within the cells, since he has noted such forms on escaping from the cell to resume their usual shape and appearance.

Cultures and Cultural Forms.—Artificial cultures of *L. tropica* are as readily secured as those of *L. infantum*, but, apparently, both of them are much more sure of success than in the case of *L. Donovani*. As to the medium employed, there does not appear to exist here the distinction between *L. Donovani* and *L. infantum*, since it has been found possible to secure good flagellate development of *L. tropica* in citrated human blood, as has been done both by Row and by Marzinowsky, and also in Novy's medium, as recorded by Nicolle and his colleagues and also by Marzinowsky.

Considerable differences, however, are to be noticed in the temperatures which have been observed for cultivation. While Nicolle and others cultivate at 22° C., Row reports good development between 25° and 28° C., and Marzinowsky's cultures were maintained at 37° C. This difference is certainly noteworthy, since little evidence of growth can be obtained in the case of the two kala azar parasites above 25° C. At the same time, it is

only at the lower temperature that successful sub-cultures can be secured and a strain kept going through many generations. Nicolle, for instance, mentions a culture, of human origin, of the thirty-third generation, while Marzinowsky, working at 37° C., was only once successful in obtaining a sub-culture.

In the cultural forms, as in the intracellular forms, no distinction can be observed between the three species. Nicolle in his earlier work was inclined to think that small differences, which he described in detail, did exist, but in a later communication he states that the cultural forms of *L. tropica* are absolutely identical with those of *L. infantum.* At the same time, Nicolle and Manceaux have noted that at the end of the optimum period of growth, eight to ten days, cultures of *L. tropica* are always more abundant than cultures of *L. infantum.*

Marzinowsky's studies of these cultural forms have, however, led him to conclusions widely differing from those of other observers. He believes that they afford evidence of a sexual process and he describes as male forms comparatively small parasites with a large nucleus and pale-staining protoplasm, and as females larger parasites with a small nucleus and a protoplasm which stains deep blue. As development advances he says these distinctions, with the exception of the difference in size, are lost. He also thinks that he has observed a process of conjugation between a male and a female parasite in which the two merged into one and their nuclei became fragmented and its particles distributed throughout the common mass of protoplasm. After this fusion he says that the flagellum disappears, the parasite lengthens out and becomes motionless, and the blepharoplast also vanishes, while a single large nucleus makes its appearance and is situated centrally. This he thinks is the end of the cycle, as observable in cultures, though it probably is continued in the body of the intermediate host, whatever that may prove to be. These views will, of course, need full confirmation and all that need be said at present is that the temperature at which these experiments took place was far in excess of that used by any other worker and may have had a bearing upon the appearances which he has described.

Animal Experiments.—The virus of tropical sore, like that of infantile kala azar, has been successfully inoculated into both monkeys and dogs with the production of local lesions, closely resembling those which are found in man, in which the parasites are found in the cells and from which they may be cultivated.

Nicolle and Manceaux have succeeded in infecting these animals not only with material derived directly from a human source but also by means of the inoculation of the flagellated cultural forms, the lesions produced by these two methods being identical. They found, however, that it was impossible to produce any pathogenic effect by the intravenous inoculation of cultures which were only infective when rubbed into the skin. In the case of the monkey the site they found best was either the eyebrow or the skin at the root of the nose, and in this animal the duration of the lesion was only twenty-one days. The incubation period in the dog was about a month, and they were able to prove that one attack of the sore in this animal as a rule gave complete immunity against a subsequent inoculation of the virus ; on the other hand, the intra-peritoneal inoculation of even 100 cultures of the parasite failed to produce any disease or to give any immunity to those animals.

Row, working in India with material from human sores in Cambay, was also successful in infecting *Macacus sinensis* by rubbing the human material directly into a scarified surface, but he was not successful with the inoculation of cultures. He finds some differences in his monkey results as compared with those of Nicolle and Manceaux, in such points as the incubation period, the number of parasites in the lesion, the characters of the lesion, and in the fact that he found the animals susceptible to another infection during the progress of the first lesion. None of these differences, however, appear of great importance, and it is probable that extended experience will attribute them to differences in the susceptibility of the experimental animals or other variants.

A few of the other facts determined by animal experiments with *L. tropica* will be referred to later in connexion with the question of immunity.

Pathological Anatomy.—The histological characters of tropical sores and the distribution of the parasites therein has been the subject of elaborate studies by a number of observers, but no analysis of this side of the affection could be undertaken without unduly prolonging this article, and it appears the less necessary since the work of Bettmann and von Wasielewski, of Nattan-Larrier and Bussière, and numerous others, is readily available to those who would wish to go further into the subject. No more will therefore be attempted than reference to a few of the points recently brought to light, especially to such as have any relation to the problem of etiology.

In almost all instances the parasites are found inside cells and

only a few of them free, but since the studies on which such observations are based were mostly sections of tissue, it must be very hard to be certain as to whether a particular parasite is really extracellular or has merely been pushed out of position by the action of the knife. The nature and origin of the cells which harbour the parasites occupies a large portion of the contributions dealing with the histology of tropical sore, and all are agreed that most are mononuclear cells, though wide differences of opinion are held as to their nature and origin. Giant cells have been noticed in many cases, and in some material sent from Guiana parasites have been found in such cells by Nattan-Larrier, Touin, and Heckenroth. No mention of the occurrence of parasites in plasma cells has been made. As to their presence in leucocytes, a point of obvious importance in connexion with etiology, they are commonly seen in what are called large mononuclear leucocytes, and have also been found by several observers in polynuclear leucocytes. The latter site at once suggests the possibility of the parasites being carried by such cells into the circulating blood, but, although very careful search has been made for them in the peripheral blood, there is at present only one observation of their being found, Neumann recording their presence in blood drawn from the finger in a patient who had a tropical sore on the forearm of the same side.

The distribution of the parasites in the lesion differs according to the stage of the sore, and the common experience is to find them in greatest number in the cells at the margin of the lesion and in its depths, when the boil is young and especially before it has ulcerated. In contrast to this, however, Marzinowsky states that he found them most numerous in older lesions, and especially in those which showed a tendency to cicatrization.

The gross characters of the lesions have been often described, but, now that the presence of the parasites gives certainty of diagnosis, the differences which are being recorded assume a greater importance, and there is an obvious tendency nowadays to believe that it will be necessary to subdivide these cutaneous forms of Leishmaniosis. The non-ulcerating form described by Thomson and Balfour in the Sudan may perhaps be taken as the type of one of these future subdivisions, and there is much in support of the views of those who think that the American cases will also prove to be due to a different species. At the present moment, however, there is no evidence strong enough to admit of any such subdivision of *L. tropica* into sub-species, or new species.

Another point of interest is that the sores may sometimes be found on mucous membranes as well as on the skin; this has been recorded by Cardamitis and Melissidis in a case which suffered from no less than thirty-five boils on the face and arm and in which the mucous membrane of the lip was also involved, while Carini, in connexion with the American form, says such cases are not uncommon and that ulcerations of the palate and the buccal and nasal mucous membranes, in which *Leishmania* can be demonstrated, are graver in their nature than similar lesions of the skin.

Etiology.—Recent knowledge, although full of facts which are suggestive, has afforded no definite explanation of the etiology of tropical sore. In this instance we know neither the alternative host, if one exists, nor the transmitting agent, which almost certainly must exist. The developments in connexion with infantile kala azar and its apparent mode of infection naturally direct attention to the dog and the dog-flea, especially since the two diseases are found side by side in many places, but, in spite of the fact that it has been found possible to transmit the disease to the dog by inoculation, there is no evidence of the existence of tropical sore as a spontaneous infection of these animals. The only exception is a very doubtful one. A large number of sores were found on an emaciated and moribund dog by Dschunkowsky and Luhs, and after death they found the organs heavily infected with *Leishmania.* Although some parasites were found in the sores it may only have been a case of canine kala azar.

The well-known fact that the sores are almost always on exposed parts of the body has influenced the many theories which have been advanced as to the transmitting agent, and there is hardly a biting parasite or insect which lacks an advocate.

The house-fly is thought by Row to be the carrier, chiefly on account of the coincidence of its seasonal prevalence with the most frequent period of infection at Cambay, and a similar view is expressed by Cardamitis and Melissidis, who support it by the results of some experiments in which they allowed *Musca domestica* to feed on a sore containing the parasites and believed that they got evidence of a certain degree of development of the parasites in the gut of such flies.

Phlebotomus has the support of Thomson and Balfour, and of Sergent (commenting on a paper by Cambillet), while Wenyon, who has made a very careful study of the question in Bagdad, also states that he is unable to exclude this insect.

Simulium has its advocate in Fink, and mosquitoes have frequently been suggested. In connexion with the latter, Wenyon quotes many facts observed by him at Bagdad pointing in the direction of *Stegomyia* as the possible carrier; among others, that he has by feeding experiments seen a certain degree of development of the parasite in the mid-gut.

Bugs cannot be said to have been altogethér excluded, although the fact that they seldom bite exposed parts of the body is strongly against them. Thomson and Balfour suggest them as an alternative to *Phlebotomus*, as the agent in the causation of the non-ulcerating form they found in the Sudan, and there is an interesting observation of Billet's of a man in Algiers who was bitten at night on the face by a bug, which he caught in the act, and who subsequently developed a sore at the exact spot.

It will be obvious from the above that we have still much to learn in connexion with the etiology of tropical sore and its possible relationship to kala azar. Nicolle and Manceaux sum up the situation well, speaking of the local reactions which sometimes result from inoculation of *L. infantum*, by saying, "Aucune conclusion définitive ne pourra être portée avant que nous ne connaissions par quel hôte intermédiaire s'opère le transport des deux *Leishmania*, et que nous puissions par la même juger expérimentalement des caractères de la lésion locale d'inoculation, déterminée par chacun de ces hôtes avec chacun des deux virus."

Treatment.—In the past this has been notoriously unsatisfactory, there being no method which could be relied upon to produce rapid healing of the sores. It is fortunate that they have a natural though dilatory tendency towards spontaneous cure, but the average duration is about six months, and the scarring and pigmentation which they often leave behind them is very disfiguring. It is much to be hoped, therefore, that further trial may be given to some of the methods which have been recently advocated and for which better results are claimed.

The drastic procedure of excision of the sore has still its advocates, including Nicolas and Wenyon, but it is agreed that this should only be practised if the sore is single and that it should be made to include apparently healthy tissue round the sore. If this is not done the sore may reappear in the cicatrix in a few days, as happened to Marzinowsky. The method has also the disadvantage that, if practised too soon, the individual is left without protection and may be re-infected. Free curetting should be carried out on the same principles and combined with the application of powerful disinfectants.

A new line of treatment has been recommended by Billet. The sore should be dusted with potassium permanganate, with the object of killing pyogenic organisms and, a few days later, a 10 per cent solution of methylene blue should be applied, with a view to the destruction of the protozoa. This method has also been found good by Nicolas, who recommends in addition the use of picric acid as an antiseptic, cicatrisant, and keratoplastic agent.

Another method is that of Gueyat, who advises that the crusts should be softened and the exudates eliminated by hot starch poultices kept on for twelve to twenty-four hours; next day the wound should be carefully cleaned of all debris with swabs and forceps and touched with oxygenated water or a 1 per cent solution of permanganate of potash. This is repeated until the wound is perfectly clean, when the following ointment is applied, covered with dry gauze and protected :—

Salicylate of methyl	5 grm.
Salicylate of bismuth	2 ,,
Subnitrate of bismuth	1 ,,
Oxide of zinc	20 ,,
Glycerine	10 ,,

Healing is usually very rapid, and he has never seen a case resist longer than three weeks.

Finally, Nicolle and Manceaux speak highly of the use of arsenobenzol. They tried it in two cases; to the first they gave 30 cg. with a partial improvement, and to the second 60 cg. with very rapid improvement.

In concluding this review of kala azar and tropical sore it has been thought well to deal separately with two points whose interest is common to each form of infection. These are, the demonstration of the parasite, and immunity.

The Demonstration of the Parasite.—In tropical sore this is a matter of comparative ease; the lesion lies open to investigation and it is merely a question of a little experience and a satisfactory technique to stain and identify *L. tropica*. This is, however, far from being the case in Indian or infantile kala azar, and however convincing the clinical picture, there can be no certainty of diagnosis until the parasites have actually been seen.

The means at our disposal for such demonstration are as follows: (1) Examination of the peripheral blood. (2) Vesication. (3) Spleen

puncture. (4) Hepatic puncture. (5) Marrow puncture. (6) Cultivation. Each of these will be briefly considered.

(1) *Examination of the Peripheral Blood.*—The explanation for the general failure of this method in kala azar is twofold: the parasites, if present at all, are very rare and, since they are encountered in cells and not free, the intense leucopenia which is usually found adds greatly to the difficulties of the search. In the Indian form very few positive results have been mentioned, with the striking exception of Donovan's success at Madras; as already mentioned, he has demonstrated their presence in the peripheral blood in 93·2 per cent of his recent Madras cases. On the other hand, Prashad records 213 examinations of finger blood with only one positive result, and the latter's experience is in accord with that of most observers. Donovan's technique, therefore, demands consideration and imitation. He compresses the pulp of the finger-tip for a minute before puncturing, in order to increase the number of the leucocytes, and then prepares several films in such a manner that the end of the film ends as a straight line and not in the customary "tails." The leucocytes will be found congregated in this zone, which facilitates their examination. Several slides should be searched exhaustively, and if negative the examination must be repeated at intervals of a day or two.

Nicolle and Comte advocated the collection of 1 c.c. to 2 c.c. of blood, which should be citrated and centrifuged, as in the usual opsonic technique, and the examination of the superficial layer of cells which contain an abundance of leucocytes. In a later communication, however, they record that this has yielded them no better results.

(2) *Vesication.*—The production of a blister by means of a vesicant applied to the skin was originally suggested by Cummins, and the writer is glad to take the opportunity of emphasizing this since it has erroneously been attributed to him by Nicolle and Comte. The object is to secure the examination of a larger number of leucocytes than can be done even by prolonged blood examination. It has not been very extensively tried, but several positive cases have been recorded in the infantile disease as well as in the experimental disease of the dog.

(3) *Spleen Puncture.*—This is certainly the method most commonly in use and the most reliable one, but it has the grave disadvantage that it is not altogether free from danger. A certain number of instances of fatal hæmorrhage have followed its practice, and these have led some workers to abandon it altogether. At the

same time many who have extensive experience of it consider it free from danger if certain precautions are observed. Nicolle and his colleagues have not mentioned any accident; Jemma and di Cristina have punctured 200 spleens and Bousfield 120 without trouble, and many others report similar favourable results. The following precautions should be observed: the spleen should be fixed as far as possible during a deep inspiration, if dealing with an adult; a fine, and preferably new, steel needle should be employed; both syringe and needle should be perfectly dry (to obviate hæmolysis), and no more than a drop or two of blood should be taken; even if no blood appears to enter the syringe there will almost always be sufficient in the needle of the syringe to make films for examination. The operation should be carried out rapidly and the syringe should not be held too tightly lest a sudden expiration should threaten laceration of the splenic tissue. Pressure may be kept up with the finger on the site of puncture for a few minutes and the patient made to lie down for some hours. Preliminary treatment with calcium chloride is advisable if there is any reason to think that the blood is defective in coagulability.

(4) *Hepatic Puncture.*—This method is recognized as being freer from risk than splenic puncture, but it has the disadvantage that it may yield negative results even when parasites are abundant in the liver. The syringe fills as a rule only too readily with blood, and it may safely be said in these operations the more blood the less chance of finding parasites. What is desired is a fragment of hepatic tissue, and it is not easy to obtain this by simple puncture. At the same time, it is sometimes advisable to carry out hepatic puncture, and there is no objection to this provided that too much reliance is not placed upon a negative result.

(5) *Marrow Puncture.*—This method, though largely employed in the case of experimental animals, has been little used in man. Donovan, however, advocates the perforation of the head of the tibia or of the rib with a small gimlet, which enables a sample of the marrow to be withdrawn for examination. An anæsthetic, however, is necessary, and the procedure does not appear free from danger.

(6) *Cultivation.*—This has been very little tried, but, in view of the ease with which cultures are obtainable from the spleen, at all events in the infantile disease, it might be more widely tried as a means of detecting parasites in the blood, when none can be found by direct examination. Novy, for instance, got a positive result in an infected dog when he failed to find parasites on microscopic examination.

Immunity.—In common with other protozoal diseases we possess no precise knowledge of the nature of the immunity in *Leishmania* infections. That such immunity does occur has long been known in connexion with tropical sore, in which recovery results in a very marked and durable protection against subsequent infection; but the avenues of research which are open to us in investigating bacterial immunity are here closed or non-existent. Whatever changes occur in the tissues or fluids of the body in an immunized animal or man, we are not yet able to demonstrate or measure them by any of the methods used in bacterial investigations. Agglutination experiments with cultures are negative in their results, on account of the tendency of the parasites to spontaneous clumping, and experiments to demonstrate the presence of anti-bodies by complement deviation, using extracts of organs rich in parasites as antigen, have in Cannata's hands given negative results.

What information is available, then, has been derived from observation of the diseases in man and animals and from immunization experiments on animals. As regards natural immunity, acquired by a previous attack, this, as has been said, is a well-established fact in the case of tropical sore, and has also been borne out by experiments on dogs, where it has been proved by Nicolle and Manceaux that, after complete recovery from an experimental infection, the animal is no longer susceptible. At the same time, they have found that it was not possible to induce this immunity by the inoculation intraperitoneally of large doses of the cultural forms. Apparently, the monkey, when recovered from an experimental sore, has not attained a similar degree of immunity, since it has been found possible to re-infect it soon after the attack. For the establishment of this acquired immunity sufficient time must elapse, and attempted re-infections shortly after recovery, or before this was complete, have shown that there exists a degree of hyper-sensibility to infection.

Recovery is unfortunately so rare in human kala azar that we have little knowledge of natural acquired immunity in this instance. Still, cases undoubtedly do recover spontaneously, which proves that there must have been sufficient immunity produced in such cases to destroy the parasites and bring the disease to an end. The only observation as to the duration of such immunity is that of Muir, whose successful treatment of Indian kala azar has already been mentioned; he states that recovered cases are liable to re-infection but have a milder attack. It is open to doubt whether such cases were true recoveries and whether it may not have been possible that the disease was only in abeyance.

The part played by the phagocytic cells of the host is obviously one of great importance, and it appears legitimate to attribute to phagocytosis an important rôle in both protection and recovery from infection. It is evident that all forms of the parasite, flagellated as well as non-flagellated, are readily taken up by all cells which possess this power, and it is equally evident that these cells are, in most cases, unable to destroy them. The essential factor, then, in successful immunity may be an improvement in the activities of these cells, which enables them not only to ingest the parasites but also to destroy them by intracellular digestion. The writer has mentioned the experiments in which he observed *in vitro* phagocytosis of the flagellate forms of *Leishmania infantum* and their complete disintegration within human leucocytes, and this is quite consonant with the general failure to cause experimental infection by means of this stage of the parasite; it would be interesting to try similar experiments with the flagellate forms of *L. tropica*, with which experimental infection is possible.

Very interesting results have been obtained by Nicolle and his colleagues in cross-immunization experiments with *L. infantum* and *L. tropica*. They find that recovery from an attack of kala azar protects an animal against infection with the virus of tropical sore, and have also found evidence of some degree of immunity against kala azar in a monkey which had recovered from an experimental tropical sore. They have also numerous observations on the effects of passage of each of these viruses through dogs and monkeys upon the virulence of the strain, but the varying degrees of susceptibility of these animals naturally makes them guarded in their conclusions.

The general trend of these experiments shows a close relationship existing between the different species, and it is possible that, with further experience, we may be able to take advantage of this, both for prophylactic and therapeutic purposes.

[For the references, 250 in number, the original paper should be consulted.—Ed.]

THE ANTI-BACTERICIDAL ACTION OF THE BILE SALTS.[1]

By Major S. LYLE CUMMINS.
Royal Army Medical Corps.

Bile and the bile salts are substances of great importance in connection with typhoid fever. On the one hand, they are extensively used in differential media for the isolation of *Bacillus typhosus* from the excreta, and in media designed to cultivate the bacillus from the blood; while, on the other, the survival of the organism in the gall-bladder and its association with gall stones and cholecystitis indicate that bile may play an important *rôle* in the etiology of the disease. It would appear, therefore, that a study of the mode of action of bile in culture media for the isolation of *B. typhosus* might, apart from its bearing on bacteriological technique, incidentally throw light on the far more important question of typhoid fever and the production of typhoid carriers.

The action of bile and the bile salts in favouring the growth of *B. typhosus* on differential media has been most ably investigated by Dunschmann,[2] but that observer did not extend his work to explaining the uses of bile in blood-culture, beyond the fact of its "enriching" action on the growth of the typhoid bacillus, and its power of retarding the growth of certain other organisms.

Eppenstein and Korte[3] called attention to the anti-bactericidal action of bile, and Conradi,[4] recording further experiments to the same effect, pointed to this anti-bactericidal action as explaining the utility of bile in the culture of typhoid bacilli from the blood. A feature of Conradi's work was that he found bile to inhibit the bactericidal properties of *serum*, a point to be borne in mind, as Gildmeister, in a recent communication,[5] attributes the use of bile in typhoid blood-culture entirely to its hæmolytic action, which he supposes to liberate anti-bactericidal substances from the disintegrated blood-cells.

Pies,[6] referring to Conradi's work above quoted, lays stress on

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[1] Reprinted by permission of the Editors of the *Journal of Hygiene.*
[2] *Ann. Inst. Pasteur*, January, 1909, p. 29.
[3] *Münch. med. Wochenschr.*, 1906, p. 1152.
[4] *Ibid.*, p. 1361.
[5] *Arb. a. d. Kaiserl. Gesundheitsamte*, February, 1910.
[6] *Arch. f. Hygiene*, 1907, lxii, p. 125.

the high concentration of nutrient matter in the serum as an important factor in the survival of typhoid bacilli.

Experiments carried out by the author in collaboration with Major C. C. Cumming, R.A.M.C.,[7] led us to the opinion that, in the isolation of typhoid bacilli from the blood, the anti-bactericidal action of the bile salts was of far greater importance than any enriching quality that they might possess. The experiments about to be recorded were undertaken with a view to elucidating as far as possible this anti-bactericidal action in the hope that some light might in this way be thrown on the survival of *B. typhosus* in "carriers," as well as on the properties of the bile salts as constituents of media for the culture of typhoid bacilli from the blood of cases.

Experiment 1. *Object.*—To confirm previous work in demonstrating the anti-bactericidal action of sodium taurocholate.

An agar slope of B. T. "Rawlings" was emulsified in 10 c.c. of sterile normal salt solution.

A series of dilutions of this emulsion were prepared of the following strengths :—

One in 1,000 ; 1 in 10,000 : 1 in 100,000 and 1 in 1,000,000. It was desired to compare the bactericidal effect of a 1 in 8 dilution of normal blood in sterile water with that of the same strength of blood diluted with a 0·5 per cent solution of sodium taurocholate. It was anticipated that on mixing known volumes of the blood preparations with equal volumes of successive dilutions of the typhoid emulsion, their relative bactericidal efficiency would be manifested in their power of sterilizing the bacterial dilutions in contact with them.

TABLE I.

		Dilution series, typhoid emulsion			
		1 in 1,000	1 in 10,000	1 in 100,000	1 in 1,000,000
A. Blood, 10 c.mm. Water, 60 c.mm. Dilution of emulsion, 10 c.mm.	Findings on plates	+	−	−	−
B. Blood, 10 c.mm. Taurocholate 0·5 per cent solution, 60 c.mm. Dilution of emulsion, 10 cmm.	Findings on plates	+	+	+	+

+ = growth, − = sterile.

Series A.—To 10 c.mm. of each bacterial dilution were added 10 c.mm. of freshly drawn blood and 60 c.mm. of sterile water.

[7] Journal of the Royal Army Medical Corps, June, 1910.

Series B.—To 10 c.mm. of each bacterial dilution were added 10 c.mm. of freshly drawn blood and 60 c.mm. of a 0·5 per cent solution of sodium taurocholate. The four preparations from each series were incubated at 37° C. for twenty hours, and then spread on plates. The result is shown in Table I.

It will be seen that the mixture of blood and water was able to sterilize a 1 in 10,000 dilution of typhoid emulsion; the presence of sodium taurocholate in a similar dilution of blood annulled all bactericidal effect on even so high a dilution of bacterial emulsion as 1 in 1,000,000.

This experiment has been frequently repeated and always with a like result. It might, however, be urged that the survival of the bacteria in contact with sodium taurocholate was due, not to any anti-bactericidal action of the salt but rather to the enriching power claimed for it by Dunschmann. To settle this point, it was decided to work out the enrichment power, if any, of the sample of sodium taurocholate under examination, leaving the action of blood out of the question.

Experiment 2.—In separate test-tubes were placed 10 c.c. of ordinary peptone and salt solution and 10 c.c. of a 0·5 per cent solution of sodium taurocholate in peptone and salt. To each tube was added 10 c.mm. of an emulsion of B. T. "Rawlings," and both preparations were incubated at 37° C. for three days. A "count" of each preparation was then made, with the result that the bile salt peptone water tube contained 235,000,000 bacilli in 1 c.c., while the peptone water contained 249,000,000 per 1 c.c.

It is obvious, therefore, that the sample of sodium taurocholate under examination has no marked enriching effect in three days—in fact rather the reverse.

It may then be taken as proved that sodium taurocholate is able to inhibit the bactericidal action of normal blood.

Since it is well known that the bactericidal efficiency of the blood-fluids increases during the process of clotting and is greater in the serum than in fresh blood, it next became a question whether the bile salt acted by preventing the elaboration of bactericidal substances during clotting or interfered with their activities after elaboration.

Experiment 3.—A broth-culture of B. T. "Rawlings" was diluted as in Expriment 1. A sample of blood was then withdrawn by finger-puncture, a portion of it, in 1 in 4 dilution, treated at once, and the remainder allowed to clot and the serum treated in the same dilution after ten minutes, two hours and six hours

respectively. All preparations were incubated for twenty hours and plated.

The result is shown in Table II.

TABLE II.

		Dilution series of typhoid broth culture			
		1 in 1,000	1 in 10,000	1 in 100,000	1 in 1,000,000
A. Fresh blood, 5 c.mm. 0·5 per cent taurocholate solution, 10 c.mm. Dilution of emulsion, 5 c.mm.	Findings on plates	+	+	+	+
B. As above but with "10 minutes" serum	,,	+	+	+	+
C. As above but with "2 hours" serum	,,	+	+	+	+
D. As above but with "6 hours" serum	,,	+	+	+	+

N.B.—The broth culture dilutions were kept at a temperature of 32° F. in the intervals of being used, to prevent multiplication of the bacilli.

This experiment showed that sodium taurocholate acted, not by interfering with the formation of bactericidal substances, but by inhibiting their action.

Before proceeding further in the mechanism of this inhibition, it seemed important to ascertain whether this power was shared by the glycocholate of soda also, and whether the constituents of these salts, taurin, glycin, and cholalic acid, were able equally to interfere with bactericidal action.

Experiment 4.—Dilutions of broth-culture of B. T. "Rawlings" were prepared as before.

Solutions containing 0·5 per cent of each of the above substances were made in sterile water, and a mixture of one part of fresh blood in three parts of each solution was then prepared.

To 10 c.mm. of each blood-mixture was added 5 c.mm. of each dilution of the typhoid culture, and the preparations incubated and plated as before.

The result is shown in Table III.

TABLE III.

		Dilution series of typhoid broth culture			
		1 in 1,000	1 in 10,000	1 in 100,000	1 in 1,000,000
A. Fresh blood 1 part, Sterile water 3 parts } 10 c.mm. Dilution of culture, 5 c.mm.	Findings on plates	+	–	–	–
B. Fresh blood 1 part, 0·5 per cent sol. of taurocholate of soda 3 parts } 10 c.mm. Dilution of culture, 5 c.mm.		+	+	+	+
C. As above, but 0·5 per cent taurin sol.	,,	–	–	–	–
D. As above, but 0·5 per cent glycocholate of soda sol.	,,	+	+	+	+
E. As above, but 0·5 per cent glycin sol.	,,	–	–	–	–
F. As above, but 0·5 per cent cholalic acid sol.	,,	+	–	–	–

It appears from the above that both sodium taurocholate and glycocholate possess anti-bactericidal qualities, while glycin, taurin and cholalic acid are without any such action, sterilization of the culture being active when blood is mixed with solutions of these substances.

The cholalic acid used was an old sample which had been long in the laboratory, and it will be desirable to test this acid further when a reliable preparation is available. It is curious that, in view of the proved absence of anti-bactericidal action in taurin and glycin, and the activity in this respect of the taurocholate and glycocholate of soda, the cholalic acid should be without this quality, but, assuming the sample used to be reliable, the above experiment certainly indicates that this is the case.

It is now time to return to the mechanism of this anti-bactericidal action of sodium taurocholate.

Regarding the disintegration of bacteria as a "complement-amboceptor" reaction, it may be assumed that bactericidal activity can be destroyed by preventing the action of amboceptor or of complement or both. The elucidation of this question is complicated by the difficulty of obtaining complement free from amboceptor, but this can to a certain extent be got over by comparing two sera of different bactericidal "titre."

Experiment 5.—Object. To ascertain whether sodium taurocholate interferes with the sensitization of typhoid bacilli by amboceptor.

The serum of a rabbit possessing a considerable degree of immunity to *B. typhosus* and agglutinating it in a dilution of 1 in 200, was heated for twenty-five minutes at 60° C. to inactivate its complement. The serum of a normal rabbit was obtained at the same time and treated in the same way. A twenty-four hours' agar culture of B. T. "Rawlings" was emulsified in saline.

The following mixtures were then prepared :—

(1)	Heated immune serum	1 part
	0·5 per cent sodium taurocholate solution	1 part
	Typhoid emulsion..	2 parts
(2)	Heated normal serum	1 part
	0·5 per cent sodium taurocholate solution	1 part
	Typhoid emulsion..	2 parts
(3)	Normal salt solution	2 parts
	Typhoid emulsion..	2 parts
(4)	Normal salt solution	1 part
	0·5 per cent sodium taurocholate solution	1 part
	Typhoid emulsion..	2 parts

These mixtures contained, in all cases, the same concentration

of typhoid emulsion, and, where it was present, of sodium taurocholate. They were left in contact, over night, at room temperature to ensure sensitization of the bacteria, if this indeed could take place in the presence of the taurocholate, in the serum preparations.

The mixtures were then centrifuged for forty-five minutes, the deposits washed in saline, and again centrifuged. After a final washing the deposits were emulsified in saline, the emulsions being "matched" by opacity to eliminate as far as possible fallacies arising through unequal multiplication and unequal "deposit"—the latter especially, as there was agglutination in *both* serum preparations, though of course this was more marked in the immune serum.

It was expected that if the bile salt had not interfered with the amboceptor in the heated immune serum, the bacteria in "mixture 1" would be so far sensitized as to be able to deflect complement to a greater extent than those placed in contact with normal serum. The saline emulsion was introduced as a "control" and the "bile salt—saline" mixture to make sure that the sodium taurocholate itself exerted no "sensitizing" action on the bacteria. The four emulsions were handed to Major L. W. Harrison, who very kindly undertook this part of the work. He examined them without knowing which emulsion was supposed to be the sensitized one, until the "key" was consulted after the experiment, and he reported as follows:—

Complete deviation occurred when emulsion No. 1 was placed in contact with 1 in 50 complement, partial when No. 2 was ditto, and none when Nos. 3 and 4 were placed under the same circumstances.

"From your key, it appears that bile salt did not affect the amboceptor. Possibly there was enough amboceptor in your normal serum, in the quantity used, to sensitize your bacteria; hence the partial result with No. 2."

The fact that there was agglutination with the "normal" serum would support Major Harrison's surmise as to the possibility of the presence of amboceptors.

The experiment goes far to prove that amboceptor is not interfered with by sodium taurocholate, and the anti-bactericidal action of this salt is therefore probably exerted through an inhibition of complement.

Experiment 6. *Object.*—To ascertain whether sodium taurocholate interferes with the action of complement.

The serum of the immunized rabbit used in Experiment 5 was heated for twenty minutes at 60° C. to destroy its complement.

Equal parts of this heated serum and an emulsion of B. T. "Rawlings" in saline were left in contact for one hour at 37° C. The sensitized bacilli were centrifuged, the deposit washed in saline, and the resulting emulsion diluted in series from 1 in 10 to 1 in 1,000,000.

A mixture of normal human blood one part and 0·5 per cent sodium taurocholate solution two parts, was then prepared and allowed to stand for one and a half hours. Ten c.mm. of this preparation was added to an equal volume of each dilution of the emulsion of sensitized cells. At the same time, as a control, 10 c.mm. of normal salt solution was mixed with an equal volume of each bacterial dilution.

Both series were then incubated for twenty hours and plated.

It was anticipated that, if complement were still active in the blood-bile salt mixture, this would enable the already sensitized bacilli to be dissolved, and the higher dilutions of bacterial emulsion would be sterilized.

On plating, however, it was found that there was complete growth in all the dilutions up to 1 in 1,000,000, proving that the blood, when mixed with sodium taurocholate, was unable to "complement" the sensitized bacilli.

It is evident then that the anti-bactericidal action of sodium taurocholate depends on interference with the complement, and not on inhibition of the action of the amboceptor.

It is not suggested that the taurocholate can prevent the complementing and digesting of sensitized typhoid bacilli when the latter have been ingested by phagocytes. Such observations as have been carried out indicate that phagocytosis and intracellular digestion of typhoid bacilli can both take place in contact with a 0·5 per cent solution of sodium taurocholate in citrated normal salt solution, though the destructive action of the bile salt upon the blood elements renders the observation difficult and unsatisfactory. But short of interfering with phagocytosis, the "anti-complement" action of the bile salts may perhaps have an important rôle in typhoid fever and the production of "carriers."

It may be permissible to consider for a moment the conditions obtaining in, say, the third week of an attack of typhoid fever. The agglutinating power of the blood is now high and the clumped bacteria have been, to a great extent, filtered out of the general circulation. It is tempting to imagine them "held up" in con-

siderable aggregations in the internal organs, such as the spleen, the liver and the adenoid tissue of the intestinal mucosa.

Probably the anchoring of "clumps" in these organs makes the work of phagocytosis both by leucocytes and tissue cells an easier task in some respects, but the ingestion of many virulent bacteria must also lead to the breaking down of leucocytes and, in all probability, the liberation of complement. In other words, at this time, there is probably an appreciable amount of extracellular solution of the typhoid bacilli: a surmise which is supported by the onset of the toxic symptoms characteristic of the later stages of the disease.

But while the liberation of complement leads, in most situations, to the extracellular solution of the already sensitized bacilli, the presence of bile at any given point would presumably prevent this solution, and enable even sensitized typhoid bacilli to survive and multiply. It is just in the positions where such an anti-bactericidal action of the bile is possible that foci of infection are found in typhoid carriers, *e.g.*, throughout the hepatic area and in the mucosa and walls of the gall-bladder.

The hypothesis put forward, while perhaps too speculative to be of value in itself, may give point to the experiments here recorded, and emphasize the importance of further work on the possible rôle of the bile salts in typhoid fever and its sequelæ.

In conclusion, I would express my indebtedness to Majors L. W. Harrison and C. C. Cumming, R.A.M.C., for their kind help, and to the editors of the *Journal of Hygiene* for several references to German literature which were of great service in compiling this paper.

INSANITY IN THE ARMY DURING PEACE AND WAR, AND ITS TREATMENT.

By Lieutenant-Colonel A. G. KAY.
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Until recently nervous and mental diseases in the Army have received very little recognition in this country, but the apparent increase of these conditions makes the subject deserving of special study. In France and Germany statistics show that there has been a continuous increase in mental diseases in the army for the last ten years, the incidence at present being alarming. In this country, also, statistics show an increase, though not quite to the same extent. Part of this increase is apparent and appears to be due to better methods of recognizing cases on the border line.

Again, improved sanitation and other measures have lessened the incidence of infective diseases, while mental and nervous conditions have been unaffected by such measures. There is no doubt also that recent years have witnessed an increase of insanity in the general population, and this is naturally reflected in the Army.

It is my object first of all to give figures showing the existing conditions in the armies of the principal countries, to compare these figures with those of previous years, and to attempt some explanation of them. I shall then proceed to discuss the effects of war on mental and nervous diseases as shown in recent campaigns, and lastly to consider the best measures to be adopted in dealing with the insane in the Army during peace and war.

I propose to discuss the subject under the following heads:—

(1) Statistics showing actual or relative increase of mental diseases in the principal armies.

(2) The types of insanity in the Army; statistics showing frequency of various kinds, and discussion of causation.

(3) The increase of insanity during war, with statistics from recent campaigns.

(4) Methods of dealing with insanity and mental defects during peace and war.

(1) Statistics showing Actual or Relative Increase.

German Army.—Dr. A. Cramer, in a paper on "Border-line states in the Army and Navy" (*Deutsche Militärärztliche Zeitschrift*, April 5, 1910), says that among recruits the rejections

owing to insanity and marked mental weakness have gradually increased, as the following figures show :—

	1903-4	1904-5	1905-6	1906-7
No. of rejections per 1,000 ..	1·3 % ..	1·4 % ..	1·4 % ..	1·8 %

This, however, is not so much due to an actual increase of insanity as to a better recognition of the condition. The kind of mental defect which shows marked increase is a degenerative psychosis—adolescent insanity; apparently this is not brought on by external causes incident to the commencement of military life, but new conditions of military service appear to act as an exciting cause to congenitally predisposed individuals.

With regard to "border-line" states, these are being increasingly recognized and defined.

All the conditions of mental instability, not sufficiently marked for the diagnosis of insanity to be actually made, may be grouped as "border-line" states. The diagnosis is difficult and cannot be made except by long-continued observation of the individual. It is impossible to give actual figures relating to the frequency of this condition. In the case of neurasthenia and hysteria, Dannehl (*Deutsche Militärärztliche Zeitschrift*, December 5, 1909) has given some figures. Neurasthenia has increased from 0·29 per 1,000 in 1896-7, to 1·01 per 1,000 in 1905-6. Hysteria from 0·23 to 0·67 per 1,000 for corresponding years.

The conditions which may be grouped under "border-line" states are as follows: Neurasthenia, degeneracy, hysteria, traumatic neuroses, epilepsy, imbecility, cerebral syphilis, and chronic alcoholism.

Professor E. Meyer in the *Deutsche Militärärztliche Zeitschrift*, August 20, 1909, refers to the enormous increase in the number of cases of insanity among the whole German population. Thus in 1880 there were 25,000 cases in all the asylums of Prussia. In 1900 the numbers had increased to 70,000, the increase being out of all proportion to the increase of the population.

The incidence of mental disease in the German Army from 1897 to 1902 averaged 0·92 per 1,000 of strength per annum.

In 1874-5 the admissions for mental diseases were 0·21 per 1,000, while in 1902-3 the rate was 0·84.

With regard to the types of mental disease, the great majority of the cases show signs of weak mental development dating from birth.

In war the strain and hardships cause an increase in the number

of admissions for mental disease, most of which take the form of acute mental exhaustion.

It is noteworthy that alcoholism has shown a decrease. Dr. Drenkahn, in the *Deutsche Militärärztliche Zeitschrift* for May 20, 1907, gives the following figures: In 1886-7 the rate per 1,000 for alcoholic insanity was 0·4. In 1905-6 the rate was 0·3. On the other hand, the figures for other kinds of insanity show an increase. In 1874-5 the rate was 0·5 per 1,000. In 1905-6 it was 1·1.

French Army.—In the French Army the total number of officers and men who were discharged or died from mental disease increased from 60 in 1877 to 840 in 1904.[1] This increase appears to be due to a large extent to a better recognition of the more ill-defined types of mental disease and border-line conditions. This is shown by the fact that the figures for general paralysis (usually a well-defined condition) show very little change.

The number of discharges for idiocy and imbecility increased from 0·04 per 1,000 in 1893 to 0·28 per 1,000 in 1904. This is chiefly due to the fact that formerly the less marked cases of imbecility were kept in the Army, but this is not so at present.

Among other noteworthy points in the French statistics are the greater frequency of mental diseases among the troops of Algeria and Tunis, and among the soldiers in prisons, penitentiaries and *corps d'épreuve.*

Officers show a marked preponderance among the cases of general paralysis. Out of every 1,000 officers, 0·85 left the Army for mental disease, 0·53 suffering from general paralysis and 0·32 from other psychoses. Among the men 0·33 per 1,000 were discharged for mental diseases, general paralysis only accounting for 0·005 per 1,000.

Drs. Antheaume and Mignot (who are at the head of the State Lunatic Asylum at Charenton, which receives all the officers and soldiers afflicted with mental diseases) in their book[1] point out that mental diseases in the French Army are more frequent than French critics are willing to admit.

Among the infantry the disturbances most frequently observed are psychoses synchronizing with attacks of mental exhaustion. The sudden change from comparative comfort to an existence imbued with all the rigors of military discipline, not to mention the exactions incident to enforced mental and physical exertion, entails something more than the ordinary soldier possesses, namely, the

[1] "Les maladies mentales dans l'armée française," par Antheaume et Mignot.

sort of adaptability associated only with men who are habitually in possession of normal intellectuality. One can readily see that since the individuality of the ordinary soldier is none too strong, he will not be long in manifesting insanity, should there be a predisposition to cerebral disturbance—a deplorable condition that is brought on partly by the officers in charge of regiments who seem to see in his lack of ability to submit to stringent military rules only what is perverse in human nature that must be corrected by increased discipline. Thus stubbornness is held responsible for insubordination and disregard of military rules, for open rebellion, when mental disease should be regarded as the prime cause. Among officers, the authors also note an increase in insanity. General paralysis is said to occur as often as sixty-three times in every 100 cases of insanity in officers, and its great danger lies in the fact that it may remain unrecognized for some time.

A case is cited of a captain of Artillery, held in thrall by delirious ideas, which had not been remarked by his associates, who hurled himself against a stone pier whilst galloping at the head of his battery and on another occasion had the cannon mounted in places so difficult of access that it required considerable manœuvring on the part of the gunners to fire them.

These facts show beyond a doubt the importance of eliminating from an army those who are mentally unbalanced, directly the first symptoms are noticed. The suggestion is made by the authors that very drastic measures are necessary, and to effect this a corps of expert alienists is required.

The British Army.—The Army Medical Report for 1908 gives the following figures: Total number of recruits inspected, 61,278. Rejected for weakness of intellect: (1) On inspection 54, equal to 0·88 per 1,000 inspected; (2) Three months after enlistment, 71, equal to 1·16 per 1,000 inspected.

During the period 1898-1907 the total number inspected was 711,716. Of these there were rejected for weakness of intellect:—

(1) On inspection 904, equal to 1·27 per 1,000.

(2) Within three months of enlistment 606, equal to 0·85 per 1,000.

Invaliding.—Since the South African War there has been a notable reduction in all classes of disease, though the fall has affected some classes more than others. In 1908, for the first time in the history of the Army, the ratio of invaliding for diseases of the nervous system (nervous and mental diseases) is higher than that of any other group. This fact is not due to an actual increase

in the invaliding for diseases of the nervous system, but to a decrease in that due to other diseases.

TABLE I.—ADMISSIONS AND INVALIDS DISCHARGED FOR MENTAL DISEASES FROM 1886 TO 1908.

All Troops at Home and Abroad.

Year	Strength	Admissions	Invalids discharged	Ratio per 1,000	
				Admissions	Invalids discharged
1886	188,132	333	233	1·8	1·24
1887	193,627	318	192	1·6	·99
1888	199,992	327	212	1·6	1·06
1889	198,474	281	211	1·4	1·06
1890	196,782	294	196	1·5	1·00
1891	196,104	304	233	1·6	1·14
1892	202,185	288	218	1·4	1·08
1893	205,509	302	235	1·5	1·14
1894	207,287	254	256	1·2	1·23
1895	205,879	235	197	1·1	·96
1896	207,093	250	194	1·2	·94
1897	201,408	268	223	1·3	1·11
1898	205,788	279	241	1·4	1·17
1899	206,023	258	234	1·3	1·13
1900	247,819	488	371	2·0	1·50
1901	228,816	401	315	1·8	1·38
1902	286,026	520	324	1·8	1·13
1903	263,888	382	350	1·4	1·33
1904	257,079	337	309	1·3	1·20
1905	248,827	246	270	1·0	1·08
1906	241,008	219	264	·9	1·10
1907	228,605	218	185	1·0	·81
1908	226,549	188	190	·8	·84

Note. — During the period October, 1899, to May, 1902, there were 640 admissions for mental disease amongst the troops serving in S. Africa (exclusive of colonials and irregulars): these are not included in this table. What proportion of this 640 were invalided is not known.

The Army Medical Report for 1908 says: "The position of nervous diseases as a cause of invaliding is of interest since the same thing is noted in other armies, notably the German and Italian. In these armies the increase is actual, not merely relative."

In the *Giornale de Medicina Militaire* there is a paper by Dr. Placidio Consilio of the Italian Medical Service, referring to this point. He shows that the ratio of invaliding for diseases of the nervous system in the Italian Army has increased from 0·56 per 1,000 in 1876, to nearly 3 per 1,000 in 1904, the increases affecting both mental and nervous diseases, though the latter have increased to a greater extent than the former. In the past twenty-nine years, 1874 to 1904, mental diseases would appear to have increased in a ratio of 1 to 4·5, and nervous diseases have increased from 1 to 7 approximately. It will at once be recognized that this actual

increase in the Italian Army is a much more serious matter than the purely apparent increase shown by our figures.

In the British Army 383 men were invalided for diseases of the nervous system in the year 1908, of whom 193 suffered from nervous, and the remainder from mental diseases.

Amongst the nervous diseases the most important place is occupied by epilepsy, which accounted for 108 out of the 193 cases belonging to this class. This disease was due in all cases probably to a central lesion existing prior to enlistment and its prevalence cannot therefore be fairly attributed to causes connected with the Service.

Of mental diseases the most serious was melancholia, 73 cases; then delusional insanity 54 cases, and mania 31 cases. The remainder are stated to be unimportant.

Of the various stations of the Army, the West Coast shows the greatest proportion of cases, and so does Algeria in the French statistics. Of the more important stations, the United Kingdom and Gibraltar showed rather higher figures than Malta, India and South Africa. It is worth noting that the stations of the Mediterranean show higher figures for mental diseases than either South Africa or India.

(2) Types of Insanity in the Army.

The forms of insanity most prevalent in our Army are melancholia, mania, and the delusional types; very few cases of general paralysis of the insane occur, although there is always a large amount of syphilis and its *sequelæ*.

Our short-service system would partially explain the comparative infrequency of this particular form, but I also think the more effectual methods of treating syphilis would account for the absence of general paralysis of the insane perhaps better than any other reason.

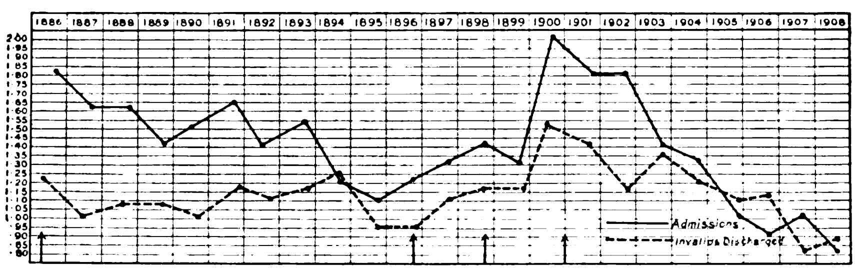
TABLE II.—Number of Cases of Diseases under Treatment during the Years 1900 to 1908 inclusive, shown as a Percentage.

Disease	1900	1901	1902	1903	1904	1905	1906	1907	1908
Idiocy	1·96	1·72	·77	—	·35	1·15	—	·81	—
Mania	20·72	19·31	17·78	17·18	21·95	17·62	15·66	18·70	16·53
Melancholia	35·02	38·62	45·12	52·45	46·34	42·53	43·43	46·34	40·50
Dementia	29·69	19·10	17·97	15·95	13·59	18·01	14·64	12·19	6·61
Mental stupor.. ..	·84	3·65	2·68	2·15	1·04	1·92	1·52	2·44	2·48
General paralysis of insane	1·12	2·15	1·54	1·53	·70	1·53	1·52	·81	1·65
Delusional insanity ..	10·65	15·45	14·14	10·74	16·03	17·24	23·23	18·70	32·23

The largest number of cases of insanity occur between the ages of 20 and 25, and in the first five years of service. The lesser incidence of insanity in the British Army as compared with other countries is in my opinion principally due to the fact that ours is a voluntary army, and also to the very special care taken during recruiting to exclude those in whom the very slightest signs of insanity can be detected.

Medical officers examining recruits are bound by regulations to test the mental capacity of every recruit before enlistment. This is done by directing attention particularly to mental alertness, and to signs of degeneracy, epilepsy, and all forms of nervous instability, or any other condition likely to produce mental weakness. In this way, so far as medical skill can prognosticate, the psychically weak are eliminated.

CHART SHOWING ADMISSIONS PER 1,000 OF STRENGTH FOR MENTAL DISEASES IN THE ARMY AT HOME AND ABROAD.



End of Egyptian campaign

Ashanti

Omdurman

S.A. War.
640 admissions for mental diseases amongst Imperial troops, and dealt with in S.A. statistics not included in above figures.

At the same time it must be very apparent that from defective heredity some who have managed to pass the stringent tests of the recruiting officers will become insane later. Personally I can see no way in which this is to be avoided or further minimized, as the family history of insane heredity if gone into would be valueless, there being an underlying element of deception ever present among recruits eager to become enrolled.

Besides the ordinary medical officers, there are medical inspectors of recruits in each command who have within three

months from date of enlistment the power to weed out any undesirables from any cause whatsoever, who may have managed to evade the recruiting medical officers at their examinations.

This special provision in recruiting is undoubtedly a pre-eminently telling factor in the diminished amount of invaliding in our Army of late years.

TABLE SHOWING CLASSIFICATION OF MENTAL CONDITIONS.
Average strength = 107,392.
United Kingdom.

Mental diseases	Admitted into hospital	Deaths	Invalids discharged from service	Average number constantly sick
Idiocy	5	–	2	0·48
Mania	18	1	15	1·68
Melancholia	29	1	28	4·45
Circular insanity	2	–	1	0·44
Mental stupor	6	–	4	0·53
Delusional insanity	15	–	17	2·58
Impulsive insanity	2	–	1	0·19
Insanity of myxœdema	1	–	1	0·03
General paralysis of the insane	3	–	4	0·36
Dementia	5	–	5	0·67
	86	2	78	11·41

(3) INCREASE OF INSANITY DURING WAR.

The increase in insanity during war is well shown in the Chart on page 152 and the amount of increase is proportional to the duration of a campaign.

So far as I have been able to ascertain, mental diseases have not been specially reported upon in the Medical Transactions of our own wars, but from an analysis of data which have been compiled two facts stand out prominently.

(1) Insanity is invariably increased as the result of war.

(2) The prevailing types of the disease are the depressive and delusional forms.

The conditions of modern warfare calling large numbers of men into action, the tremendous endurance, physical and mental, required, and the widely destructive effect of modern artillery fire will undoubtedly make their influence felt in a future war, and we shall have to deal with a larger percentage of mental disease than hitherto.

Regarding the effect of a campaign on mental diseases, the experiences of the Russo-Japanese War have furnished valuable information. It is worthy of note that this was the first time in which mental diseases were separately cared for by specialists

from the firing line back to the home country. The experiences on the Japanese side have not yet been published. The Russian experiences have however been fully reported.

It is difficult to estimate the total number of cases of mental disease in the Russian Army. The reports of the Central Psychiatric hospital at Harbin, Manchuria, from December 15, 1904, to March 18, 1906, show that 1,747 were sent back to Russia.

Professor Autokratow, in charge of a hospital for mental diseases under the Red Cross Society, believed that the total number sent back was very nearly 2,000.

Owing to the small size of the Central Psychiatric Hospital at Harbin, the cases were sent back to Russia as rapidly as possible. The average time per patient in the hospital was fifteen to sixteen days. The average number of patients per day was forty-three, the average monthly admission-rate was 90, the average monthly transfer of patients to Moscow was 82. Of the total number recorded, 275 were officers and 1,072 were enlisted men. These were finally disposed of as follows: Recovered, 105; transferred, 1,197; discharged for disability, 20; died, 25.

The journey to Moscow was 5,303 miles, and occupied a month by train. The surgeons accompanying them were as far as possible trained psychiatrists and they uniformly reported that patients were the worse for the journey. For the cases that grew much worse on the way, Professor Autokratow established hospital stations at different points along the route where patients could be left. Each of these hospitals was in charge of an experienced psychiatrist.

At the end of the war, forty-five insane were conveyed by sea from Port Arthur to Russia. The journey lasted about seventy days and it was found that the insane were more liable to sea-sickness than healthy men and their mental condition grew worse. In contrast to this our insane in the British Army generally improved on the voyages home from China, India and South Africa.

The type of psychosis during the war was of a depressive character, as was also the case in the South African War.

Shaikewicz (*Centralblatt für Nervenheil. und Psychologie*, 1906) has described a peculiar psychosis occurring in these cases.

The patient lies for weeks without any movement, staring at the wall. He usually eats if the food is placed in his mouth. He has hallucinations, but they do not seem to influence him in his movements. He is depressed and exhausted.

Soukanoff (*Journal de Psychologie et Neurologie*, 1906) divides the cases into acute and chronic forms.

The chronic forms he thinks are dementia præcox, coloured by the circumstances of their origin.

The acute cases he classifies as follows :—

(1) Depression with hypochondriasis.

(2) Depression with acute mental confusion.

(3) Depression with stupor.

(4) Depression with paranoia.

These cases show a large percentage of recoveries.

The most reasonable explanation of the effect of war is that it sets a special stamp upon diseases in the same way as do different social classes, or different races, or great catastrophies in Nature.

Steida (*Centralblatt für Nervenheil. und Psychologie*, 1906) says that battle as a psychic trauma is not alone sufficient to cause a psychosis.

The most immediate results of battles are hysterical excitement and confused states. These usually clear up within a few days, but irritability, fearfulness and emotional instability remain for weeks. He lays as much weight upon the prolonged exertion, the deprivations, the loss of sleep, hunger and thirst as upon the psychic trauma of battle.

Among the Russian officers there was a higher percentage of alcoholic psychosis, and also neurasthenic and hysterical conditions.

Wagner (*Militärärztliche Zeitschrift*, 1908) describes many cases of hysterical fright with great excitement and confusion, ending finally in a semi-conscious state with great mental and bodily weakness.

The lack of complete examination of officers and men before going to the front greatly increased the number of mental cases.

Professor Autokratow personally saw officers in the early stages of paresis and with arterio-sclerosis going to the front, only to be returned in a few months with more active manifestations of their ailments.

(4) Methods of dealing with Insanity and Mental Defects during Peace and War.

We have seen that war is likely always to lead to an increase in the number of mental diseases in the Army, and many cases on the border line, or those psychically weak, will under the stress and hardship incident to war become mentally afflicted and have to be placed under restraint.

This fact shows the necessity of keeping all who are mentally defective out of the army, for though in time of peace it may be possible to make fairly useful soldiers of them, in time of war they are not only useless, but are a source of serious danger.

It is impossible, however stringent the examination on entrance, entirely to eliminate from an army all the psychically weak, and during war there is likely to be an outbreak of insanity.

It is therefore important to arrange a system of treatment of such cases.

Dr. Stier, in a paper in the *Deutsche Militärärztliche Zeitschrift*, July 5, 1908, deals with the important subject of treatment of the insane in time of war.

(1) For the cases of acute mania occurring among the troops in the fighting line, he recommends hypodermic injections of hyoscine 0·0006 to 0·001 grm. combined with morphine 0·002 grm. This is usually sufficient to render the patient unconscious. The advantage of such treatment is that the patient is kept quiet and there is no need of a special attendant. In case of accidents or where this fails to act, a strait-waistcoat should be employed.

The disadvantage however of hyoscine is its danger. The transport of patients to the rear is best accomplished by keeping the patients well under the influence of sulphonal or trional. The latter drug may be given in doses of 1 grm. four times daily one or two days before transport takes place.

The Care and Treatment of Insanes on the Lines of Communication.

(2) The experience of the Russians in the late war shows that we must expect increasing numbers of insanes to be constantly sent back from the fighting line to the lines of communication. The most suitable place for the treatment of the insanes, before arrangements for their transfer to home territory are made, is at the headquarters of the line. Here building operations can be carried out if necessary and ambulance trains are available. The hospital for mental diseases should be in charge of a mental specialist and should be staffed by sick attendants and a non-commissioned officer of the medical corps experienced in dealing with insanes as ward master.

The number of cases of insanity will naturally depend on circumstances. In the late Russo-Japanese War, out of every 1,000 admissions to hospital there were 3·5 insanes. For an army consisting of three army corps and a reserve division there would be

forty field hospitals with 8,000 beds, and provision should be made for the treatment of about thirty insanes. Dr. Stier thinks it advisable that accommodation should be provided for a larger number than that, in case of emergency.

In the British Army the treatment is on similar lines, but before entering into the question of the treatment of the psychically ill in the field it would perhaps be advisable to give a brief review of the various echelons of medical service in different zones in the field for the removal of the sick.

The areas of work are: (1) The collecting zone. (2) The evacuating zone. (3) The distributing zone. The first is the region of active operations. The second embraces the lines of communication, and the third the base or home territory.

In the first or collecting zone we have the medical service with regimental units and the field ambulances. In the second or evacuating zone there are the clearing hospitals and ambulance trains, and in the third or distributing zone there are stationary hospitals, general hospitals and the military hospitals in the home country.

In this way there is a linking up of all parts of the medical service.

The insane are thus kept constantly under surveillance, no matter where their position in the field is. On reaching the hospital for insane soldiers at the Royal Victoria Hospital at Netley, England, provision is made for their treatment on the same lines as in civil asylums. All our insanes are discharged from the Army as permanently unfit. This is to my mind a wise precaution as relapses are common. Up to the present a special unit for the removal of insanes has not been adopted by our Army, although it was reported on as useful, effective, and valuable in the Russo-Japanese War. This unit would pass the insanes down the line, it would undertake the whole work of organizing local and other resources for clearing the field ambulances and clearing hospitals. It would establish the rest stations as ordered along the line of route, and relieve the executive of the various hospitals of the anxiety and responsibility of dealing with such cases and fill up the gaps that may exist between them and the rail head.

Rest stations are very important, and any scheme embracing such would make for greater efficiency. In their transit along the lines of collection, evacuation and distribution I would regard the organization of auxiliary transport and rest stations as most important factors in ensuring care and treatment of insanes and

the proper co-operation of the medical units with the general work of the Army in the field and with one another.

This, let it be understood, does not imply an elaborate and special provision for the insanes such as was made by the Russians at Harbin, for in my humble opinion such specialized organization by suggestion only tends to increase the frequency of malingering in the field.

The difficulties of proving feigned insanity should make us ever watchful to guard against this, and to have a system of prolonged observation in force in doubtful cases so that a malingerer would abstain from this method if he did not want to serve. If a case was proved the punishment should be severe enough to act as a strong deterrent from such practices.

United Services Medical Society.

FUNCTIONS OF HOSPITAL SHIPS.

By Fleet-Surgeon D. J. P. McNABB, R.N.

After a few preliminary remarks on hospital ships in general, I propose to submit to the meeting some considerations or suggestions on the following points:—

(1) Functions of the hospital ship in peace time.

(2) Functions of the hospital ship in war time.

(3) Methods of transporting sick and wounded to hospital ships.

(4) Methods of embarking sick and wounded into boats from fighting ships.

A hospital ship may be defined as a ship placed at the disposal of the Commander-in-Chief for the purpose of relieving his fleet of sick and providing them with the best possible accommodation and opportunities for treatment in peace time; and in war time undertaking the care of all the wounded resulting from a naval action so avoiding the necessity for depleting the fleet by having to detach ships to a base to get rid of the wounded.

To fulfil these requirements a hospital ship should have ample accommodation to deal with every class of disease or injury which is likely to be met with; she should be well found in all the essentials for comfort, and in every well-tried and up-to-date appliance for dealing with wounds and disease; she should be constructed or transformed with a view to giving fair play to the main canons of hospital construction, namely, light airy wards as little encumbered with accessories as possible, easy access to the wards, efficient and up-to-date arrangements for cooking and bringing food to patients, well arranged lavatories and latrines, and a well-trained nursing staff. Moreover, she must be entirely independent of the fleet in the matter of supply of food, coal, water, and in the matter of the crew required for her maintenance and locomotion.

Hospital ships have been attached to fleets on many occasions prior to the present day, but in most cases these have been men-of-war or merchant vessels which have been transformed temporarily, and the qualities of a good hospital have in many instances been sacrificed to the peculiar character of the ship employed.

As a purely naval hospital ship the "Malacca" may be quoted.

She was a P. and O. cargo steamer which was transformed and sent out to the Naval Expedition which dealt with the city of Benin in 1897. Naturally, the vessel was sent out empty of cargo, and had little or no ballast beyond water ballast; as a result she rolled so much while at anchor off Forcados River that at no time were the fiddles off the dining tables, making efficient nursing a matter of difficulty, whereas by contrast the men-of-war anchored in the same place were comparatively steady. This is only one defect. There were many others. Still, she was equipped speedily and did good work.

In later days the "Maine" has shown that in peace time she can cater very satisfactorily for the medical and surgical wants of a fleet, though in many respects she too falls short of what is desirable.

From this and the experience gained in military hospital ships we should have plenty of material to embody a new and specially built vessel.

I have not attempted to go into any details as to the construction of the ideal hospital ship, as that is rather too comprehensive a subject for a paper like this, but I have confined myself to a more or less general review of the possible duties of such a ship in both peace and war, with a view to drawing out criticism and ideas likely to be of use to medical officers who may have to advise various Commanders-in-chief on points connected with the use of the hospital ships at their disposal.

The Functions of a Hospital Ship.

In peace time the duty of a hospital ship is to accompany the fleet on all cruises, and to carry out towards that fleet all the duties which are normally ascribed to the shore hospitals.

It follows from this that the design or arrangement of any hospital ship must be such that the general principles of a hospital are given fair play.

Whilst the fleet is cruising the hospital ship might accompany it or make an independent passage from port to port according as the Commander-in-chief may determine, her wireless equipment rendering her easy of access.

Naturally only cases of extreme urgency would be transferred in the open sea, and the circumstances attending this will be discussed later on.

On arrival in harbour the number and nature of cases to be

sent from each ship would be signalled from the flagship, and the routine of their reception in the hospital ship set in motion. This routine is a matter of detail, but it is an essential in a hospital ship that she should always be in a state of preparedness for the reception of patients, and it is only by the establishing and practising of a definite routine that the business of the ship can run smoothly.

The preparation for embarkation, the actual embarkation, the conduct of patients on board, and the disembarkation practically summarize the duties of a hospital ship.

(*a*) *The Preparation.*—This includes reviewing ward inventories, preparation of beds and utensils, testing electrical fittings, seeing that latrines are in proper working order, and fresh water supplies efficient. Ventilating shafts must be examined. Labels with pieces of yarn should be attached to each bed for the purpose of identifying and storing such clothing as each patient may be wearing when brought to his bed. Lifts should be seen to be working properly.

Incidentally I might mention that all the beds in the hospital ship wards should be numbered. This is advisable both in telling off the beds for incoming patients and in disposing of the occupants of the beds to the various boats in case of having to abandon the ship.

If a nominal list of cases is available, or has been signalled, then the individuals are told off to certain beds in certain wards beforehand, so that when the cases arrive alongside they may be transferred to their respective beds without delay. Diets should be roughed out, and supply of milk, ice, and soda got ready.

(*b*) *Embarkation.*—On the approach of the patients, the derricks or whips are got ready, and the cot carriers got out under the supervision of the deck officers of the hospital ship. On arrival on board the cases are told off to wards by the wardmaster from a prepared list. In the meantime all baggage is stowed and entered in the baggage book by the ship's corporals, assisted by the working parties from the ships. All valuables are collected by the paymaster and his staff, also all papers concerning invalids are collected and registered by him.

(*c*) *Routine on Board.*—As soon as possible after arrival on board a statement of the case of each patient is copied into the hospital ticket, in accordance with the usual hospital practice, and his scale of diet is ordered.

Likewise the patients are made acquainted with their stations for "Fire" and "Abandon ship," and in the case of helpless

patients the necessary arrangements are made for conveying them to the boats.

The comfort of the patients being the first consideration in the ship, every effort must be made to check unnecessary noise, and to have machines such as capstans, boat-hoists, winches, &c., working as quietly as possible.

Care must also be taken that patients do not interfere with anything which is essential to the safety and the navigation of the ship.

(*d*) Disembarkation is practically a reversal of the process of embarkation, but it is expedited by having the cots for disembarking got ready and placed alongside each bed, and also having the baggage for each patient got out of the baggage-room and arranged on deck some time prior to the hour of disembarkation.

Of necessity it will happen that the supply of provisions for the hospital ship will be entirely independent of the victualling of the fleet, and it will be the paymaster's duty to see that there is a sufficient supply of provisions, both cold stored and others, to last at least three months without replenishing.

There should be no necessity for bringing fresh food into the ship, and if, for any reason, this should be done, it must only be with the special approval of the Senior Medical Officer.

While in harbour it is necessary that an efficient gangway watch be kept, partly by the Naval Police and partly by the mercantile crew, to prevent the access of unauthorized persons to the ship, and to check leakage of stores.

In case of an epidemic of infectious disease breaking out in the fleet, in addition to the wards set apart for these diseases in the ship herself, the hospital ship should be in a position to supply the equipment necessary to form an isolation camp on shore, on an island for choice.

Again, every opportunity should be given to the medical officers of the fleet to avail themselves of the clinical material on board the hospital ship, always providing that this is done subject to the authority of the Senior Medical Officer and without disturbing the routine of the ship.

War Time.

The duties of the hospital ship in war time, in addition to those carried out in peace, also comprise dealing with the eventualities peculiar to a naval action.

The circumstances under which these latter will be met and

dealt with depend on (*a*) whether the fleet is making a passage with the object of intercepting and fighting the enemy in the open sea; (*b*) whether the fleet is operating in narrow waters in proximity to its base; or (*c*) whether the fleet is taking part in combined naval and military operations on the enemy's coast line.

(*a*) Assuming that an action takes place in the open sea at a distance from a base, the only pretext which might induce a hospital ship to approach the fighting zone would be found in the desire to assist a battleship or cruiser which had hauled out of line owing to damage and was in danger of foundering. But as such a disabled vessel would be the legitimate prey of the enemy's destroyers or cruisers, the approach of these latter would, I suppose, be the signal for the withdrawal of the hospital ship.

The fight being over, the next point for consideration is how to relieve the fighting ships of their wounded as speedily as possible. As the action has been assumed to take place in the open sea away from any available base, it follows that the transfer of wounded must also take place at sea. In this I am assuming that the hospital ship is with the victorious fleet, because in the event of a defeat, in the first place there would not be much left to give assistance to; and in the second, the hospital ship would come under the direction of the victorious commander, who would be entitled to use her for his own wounded. The methods for carrying out this transfer will be suggested later on.

(*b*) In the second case the fleet has been assumed to be operating in narrow waters, in proximity to a base or a place which could be used as a temporary base. In that case it would seem reasonable to suppose that the hospital ship remained at that base during an action, and that after the action such ships as were not employed in the immediate chase of the scattered enemy should return to that base to disembark their wounded. It might easily happen that the whole fleet would be employed on this duty, i.e., chasing the enemy, in which case the hospital ship could follow it, taking the wounded on board at the first favourable opportunity.

In one or two of the fights off Port Arthur the Russian hospital ship accompanied the fleet and remained with it to the base, but in this case the object of the Russian Fleet was to escape from Port Arthur as an intact fleet with all its auxiliaries, and this object being defeated by the Japanese the hospital ship was obliged to return with the fleet. The Japanese never brought their hospital ships with them; they remained at the base at the Elliott Islands.

Most probably, as was the case with the Japanese as far as I know, in addition to the hospital ship there would be present at the base "carriers," that is, converted transports or mail steamers.

The cases which could bear an immediate voyage would be sent to these carriers, while the more serious cases would be retained in the hospital ship until they were in a better condition to undergo the voyage.

(*c*) Lastly, where the operations are of a combined nature, it would appear natural to suppose that where bluejackets or soldiers are landed, means will be at hand for the embarkation of the wounded.

Methods of Transporting Sick and Wounded to Hospital Ship.

Having outlined the functions of the hospital ship in peace and war, I now wish to offer suggestions on the best means of bringing the patients alongside the hospital ship under the varying conditions hinted at above.

I have divided the subject as follows :—

(1) From ship to ship.
  (*a*) In harbour or in a sheltered anchorage.
  (*b*) In the open sea.

(2) From shore to ship.
  (*a*) Good harbour for ships, with embarking facilities.
  (*b*) Open anchorage with small camber for boats.
  (*c*) River mouth, navigable for boats, but not ships.
  (*d*) Open beach.
  (*e*) Open beach with surf.

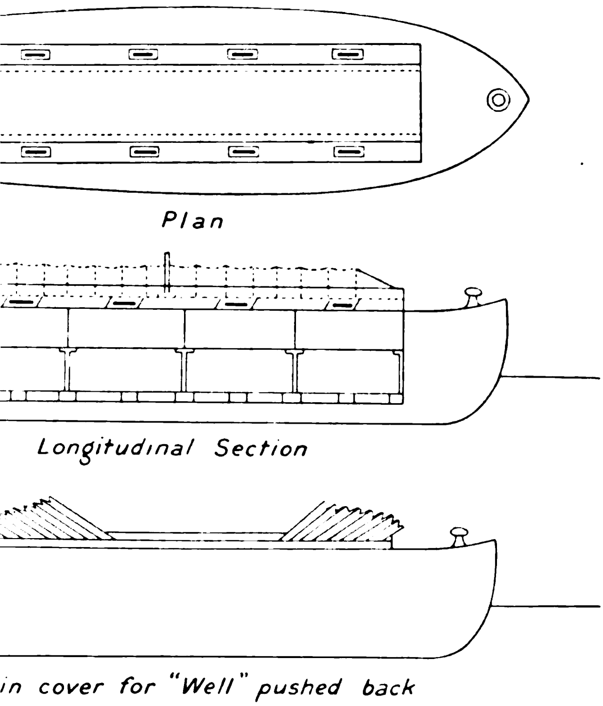
(1) (*a*) The transfer could be carried out by special hospital boats, carried by the hospital ship, and towed by motor launches. These boats should be of the following design :

Length	36 ft.
Beam	10 ,,
Depth (ceiling to deck)	6 ,,
Draught	3 ,,

Decked in, with a well 24 ft. by 4 ft. amidships, this well surrounded by coamings 1 ft. 6 in. in height. The well should be covered with a tarpaulin carried over galvanized iron spreaders of a height of 2 ft. above the coamings of the well. When this is opened, the tarpaulin is rolled or pushed back (concertina fashion,

ıg made to travel along a rail fitted on the outer ngs (see Diagram).

of the craft should be fitted to carry sixteen cots, erimposed, with a gangway amidships of 3 ft. 6 in. boat should carry her complement of cots, with ıg.



Hospital Boat.

; Beam, 10 feet; Depth, 6 feet; Draught, 3 feet (about).

g embarked, the tarpaulin and spreaders, which are one forward and one aft, are drawn together and ps. The after end of the tarpaulin should not be should hang loose as a curtain. The boat or boats d to the hospital ship, and the cases embarked in means of cot carriers and cranes.

-If the weather is calm, the same routine as carried out. If there is a heavy sea, then the more difficult; but, subject to the criticism of

experts, I would suggest the following proceeding: The hospital ship should approach the fighting ship end to end on her starboard (or port) beam, passing to leeward, and assuming that the fighting ship is lying broadside on to the sea with engines stopped. A buoyed line could be dropped from the fighting ship's forecastle, and picked up by the hospital ship; and by this a hawser run from her starboard bow to the fighting ship's forecastle, and by a repetition of the process from her port bow to the fighting ship's quarter-deck. The hospital ship would then be using the fighting ship as a sea anchor. Under the lee of this sea anchor, one or more of the hospital ships' boats could be hauled up alongside the battleship, loaded up and dropped back to the hospital ship.

The operation being repeated as often as required, oil might be used from the battleship to minimize the breaking of the seas. The ships might be kept apart by the hospital ship going gently astern during the manœuvre, and so keeping a slight strain on the cables. This is not a matter which can be dogmatized upon by the Medical Officer, but such as it is I offer the suggestion; and if it is practicable, then so much the better.

(2) Next comes the question of the embarkation from shore to ship.

(*a*) Where embarking facilities are good, with the boats available from the hospital ship, the operation should present no difficulties.

(*b*) Where there is a small harbour, camber or pier, with an adjacent anchorage for the hospital ship the same routine may be followed as in 2 (*a*).

(*c*) Where there is no camber or pier, but a river navigable for boats, then the hospital boats may be brought in and loaded from a temporary pier or floating stage, or by wading in with the cots.

In a muddy river or estuary a temporary landing-stage could be constructed by a series of rafts or pontoons anchored and connected by gangways, the stage reaching out far enough to allow of the boats being loaded at all states of the tide. The circumstances in Medina Creek, West Africa, in 1894, should be remembered in this connection.

(*d*) *Open Beach, no Surf.*—Temporary landing-stage if one is available; if not, the boat must be veered in as far as possible and loaded by hand.

If the beach is steep or there are rocky ledges available, a pair of sheer legs would probably be found for landing stores, and these could be used for embarking cots.

(*e*) *An Open Beach with Constant Surf.*—In this case it would be better to rely on some local type of boat manned by men accustomed to the work. Apropos of this I may mention that there is a model of an ambulance surf boat in the British Museum, which seems to meet all the requirements. The originals were used at Cape Coast Castle in 1873. The boats were built by Messrs. Forrest and Sons, of Limehouse, they were 25 ft. long, 5 ft. broad, with a draught of 2 ft. 3 in. They were whaler built, manned by a crew of twelve men and carried twenty-four passengers, including two cots.

As far as the hospital ship's boats are concerned I would suggest that all boats carrying sick (except surf boats) should be towed. This leaves the whole of the space in the boat to be devoted to the stowage of the sick in their cots, and lessens the number of hands required in each boat.

Methods of Getting Sick and Wounded into Boats.

The many appliances which have been and are in use on board ships are no doubt suitable, and have been found useful for the special duties they were designed for.

These articles consist of hammocks, carrying cots, stretchers of the ordinary service pattern and of special design for slinging, sleighs and cot carriers. When it comes to disembarking wounded from a ship most stretchers may be put to one side, not because they cannot be slung over the ship's side, but because of the difficulty of stowing them in the boats, and also because they are probably not numerous enough. Sleighs also are not easy to stow and their great weight makes them unhandy.

It comes to this, then, that hammocks and carrying cots are the most likely to be of use, and, especially in cases of emergency, I can see a great field for their use.

Lastly, cot carriers as at present in use are heavy wooden frames made to carry the ordinary cots and suspended from a wire strop by four wire slings. In my opinion this is too heavy and clumsy, and it cannot be carried in an ordinary hospital boat.

I would like to suggest that the cot carrier be made of stout No. 1 canvas with sides, the corners being specially strengthened with double canvas, and the whole slung by eyelets at the corners from four slings, these slings being in turn suspended from the four arms of two light spars lashed amidships diagonally. The whole could be lifted by a tackle made fast to a strop passed round the spars where they are lashed. A carrier such as this could easily be carried in each hospital boat.

Now, supposing that a hospital boat comes alongside a ship with her complement of empty cots and the cot carrier. The cots are at once passed on board either by hand or by means of the cot carrier. The patients are quickly placed in the cots, with their own bedding if there is none in the cots, the cots lifted into the carrier, and the carrier hoisted over the side, lowered into the hospital boat and emptied; this being repeated until the patients are all embarked. The carrier need not wait for cots. Patients who require it may be lashed up in their hammocks, or may be even laid in the carrier without anything. They cannot fall out, and there should be no difficulty in making a rapid transfer.

DISCUSSION.

Deputy-Surgeon-General J. J. Dennis, R.N., asked what type of ship as regards tonnage, speed, and accommodation was considered most generally suitable for a hospital ship?

Major W. S. Harrison, R.A.M.C., asked whether there were any data by which one could estimate the rate at which a hospital ship could be loaded with sick and wounded from an open shore. He had in mind circumstances in which it might be necessary to know this, as, for example, a case like the embarkation of Sir John Moore's army after the retreat to Corunna with an active enemy pressing the rearguard; or, again, the shore zone might be unhealthy, and it might be necessary to ensure that no more patients should be sent down to the coast than could be embarked in one day.

Major E. B. Waggett, R.A.M.C.(T.) inquired as to the best arrangements for isolating sick on board hospital ships. The very common arrangement of a cabin in the stern of the boat seemed to provide unnecessarily uncomfortable quarters for sick men.

Inspector-General R. Bentham, R.N. (retired) described the arrangements which were in vogue in Malta for embarking sick; he emphasized the necessity for getting the baggage on board before embarking the sick.

Fleet-Surgeon McNabb, in reply, said that the ideal hospital ship was one of from 3,000 to 4,000 tons, with a speed of about 12 knots per hour, and with accommodation for about 240 sick in peace time and about 340 sick in war time. Four isolation wards should be provided on the boat deck. It was impossible to give any definite details as to the speed at which sick and wounded could be embarked from an open shore; the character of the shore, the presence or absence of surf, and the distance of the ship from the shore, all affected the problem, but one might say that so far as the ship itself was concerned, it could take in patients at a rate of thirty to forty an hour.

Fleet-Surgeon McNabb afterwards gave a demonstration, by means of models, of the methods used in embarking sick and wounded, and in transferring them from place to place on board ship.

Clinical and other Notes.

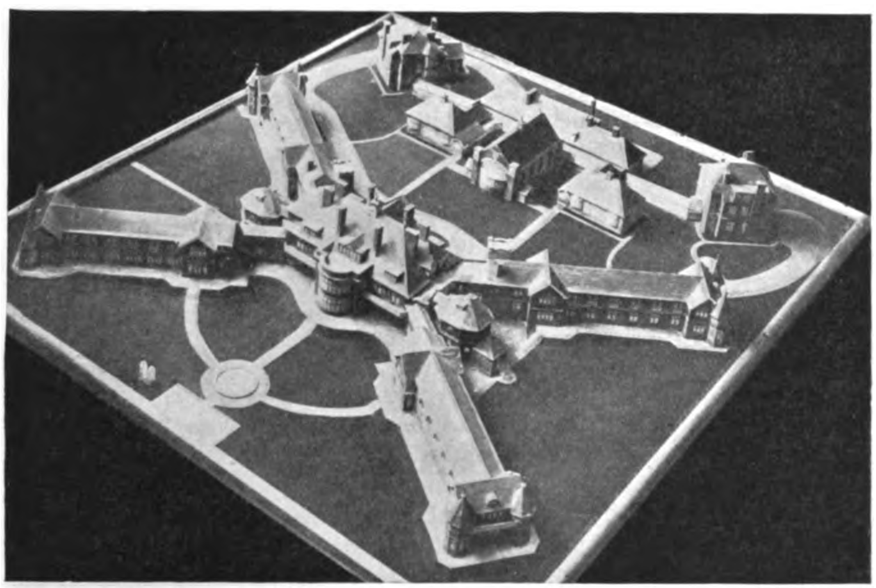
A VISIT TO THE BROMPTON HOSPITAL SANATORIUM AT FRIMLEY.

By Major F. J. W. Porter, D.S.O.
Royal Army Medical Corps.

The Sanatorium was opened about six years ago by Their Majesties. It is 380 ft. above sea-level. It contains 150 beds: 104 for men, 42 for women, 4 for children.

The photograph shows a plan of the buildings.

The Medical Superintendent in charge is Dr. Marcus Paterson, who, after holding the posts of resident medical officer and house physician at the Brompton Hospital, was selected by the committee of management to take over the institution prior to its completion, and has been responsible for its development since.



Dr. Paterson is the originator of the idea of treating the consumptive by auto-inoculation (as opposed to tuberculin injections), making use of methods not usually employed in sanatoriums, and aiming at restoring the patient to his full working capacity by a scheme of graduated rest and graduated exercise.

Patients, as a rule, are selected with few physical signs and who

are afebrile. Dr. Paterson, in his book, does not consider this the right way to make the selection, but considers that patients should be judged by their physical condition, in conjunction with their physical signs; and further states that an early case should mean a patient whose resistance to tuberculosis has recently broken down. He illustrates this point by saying that a person with a lesion the size of a pea can give off bacterial products which are completely prostrating him, whilst another patient with large cavities and extensive physical signs is still capable of hard manual labour. Those with a rise of temperature to 99° F. (in the mouth), plus constitutional symptoms, are put in bed and kept absolutely at rest by what he calls "complete immobilization" until the temperature has come down to normal and remained so for a few days.

They are then put on walking exercise, very gradually increased, until at last six miles in a day are covered; this takes from one to four weeks. The chief guide as to the desirability of increasing the daily distance being the absence of variations of daily temperature and diminution of the amount of sputum.

If they successfully complete the six-mile walking grade, they pass into the first grade of labour, lasting one week. This consists in carrying small baskets of various materials, averaging about 10 lb., and the distance travelled approximates seven miles.

If no constitutional disturbance is evoked, they pass into the second grade for a week, in which the weight is increased to 18 lb.

The third grade (one week) comprises sweeping paths, chopping wood, hoeing, cleaning windows, and light work about the house or garden.

The fourth grade lasts two weeks; digging with a small shovel is the usual work, and patients on this grade can dig 2 tons of earth and raise it 7 ft. into a cart in one day. Mowing and rolling, properly graduated, are alternative tasks.

The fifth grade lasts three weeks. A heavier shovel and pick or fork is used; 6 tons of earth can be raised 7 ft., or 10 tons of concrete mixed.

Three weeks before their discharge, they are promoted to grade six, and spend five hours daily at the heaviest navvy work, in addition to one hour's indoor work, which is incumbent on all those in the labour grades.

If they have a trade they are put to work at it, so that the muscles used in their particular work may become accustomed to it before they leave the sanatorium. The periods of work alternate with those of rest at stated intervals. Useful work is always given, so that patients seeing the fruits of their labour do not become bored.

The object of the work is carefully explained to the patients, and they thoroughly understand that the object is not to extract as much free labour from them for the benefit of the institution as possible. All, therefore, work willingly and there are no shirkers. The great difficulty is to keep them from overworking themselves.

When, owing to overwork and a consequent excessive dose of bacterial products, the patient has to return to bed, the fever only lasts a few days, as a rule. As soon as the temperature becomes normal for a day or two he starts again in the grade where he left off.

Over 300 bloods were examined at one time with the object of ascertaining the opsonic index in those being treated by graduated labour. It was found that 90 per cent. gave at one time or another an index above normal, showing that the work prescribed for each was exercising a beneficial effect and exciting auto-inoculations that were neither deficient nor in excess.

The grades for women are similar to those for men, but they are not allowed to work so hard.

Ordinary sanatorium life tends to produce neurotic individuals mentally and physically deteriorated by long periods of ease and idleness.

The introduction of graduated labour transforms this refuge for chronic invalids into a workshop of busy and hopeful men and women. Its educational value upon their after life is very important. Each arrested case becomes a missionary in the cause on his discharge.

The average length of residence is three and a half months to four months, and at the end of this time they are usually discharged with their disease arrested and their physical capacity restored to the full. Dr. Paterson does not consider that the presence of tubercle bacilli in the sputum necessarily means that the disease has not been arrested. He considers these patients are on the same footing as the typhoid carrier, their own health not being affected by the presence of the bacilli, but they are capable of infecting others.

It has been estimated that the economies effected by employing the patients' labour amount to no less than £10,177 in the six years since opening.

A permanent testimony to the harmlessness (at any rate) of Dr. Paterson's system, exists in the shape of a reservoir capable of holding 500,000 gallons, which was constructed by the patients.

No less than 5,000 tons of gravel were excavated and wheeled a distance of 500 yards, and 900 tons of concrete were mixed and placed in position. A memorial stone records the fact that no case of hæmoptysis occurred during its construction.

The annual cost per bed is about £65, and about one-third of this is expended on food.

The patients are well, but not overfed, and the dietary is made to comprise the variety of food to which the class of patient has been accustomed in his own house.

Numbered table utensils are used and washed by the patients themselves.

ADAPTION OF A FURNITURE VAN AS A CLEARING AMBULANCE WAGON.

By Staff-Serjeant W. MERCHANT.
Royal Army Medical Corps.

Much has been written of late on the subject of transport of wounded during manœuvres or on service; but we have still to solve the problem of the removal of the sick from the field ambulances or collecting zone.

The clearing hospital (200 beds) should be capable of great expansion if necessary, but it might easily become clogged and unable to fulfil its intended function; i.e., to clear the ambulances. It is necessary, therefore, to keep the clearing hospital free to cope with the sick and wounded by passing them on to the distributing zone.

Our present means of removal is the utilization of general service wagons returning empty from the front to the supply parks, and a constant flow of these would be required for this purpose.

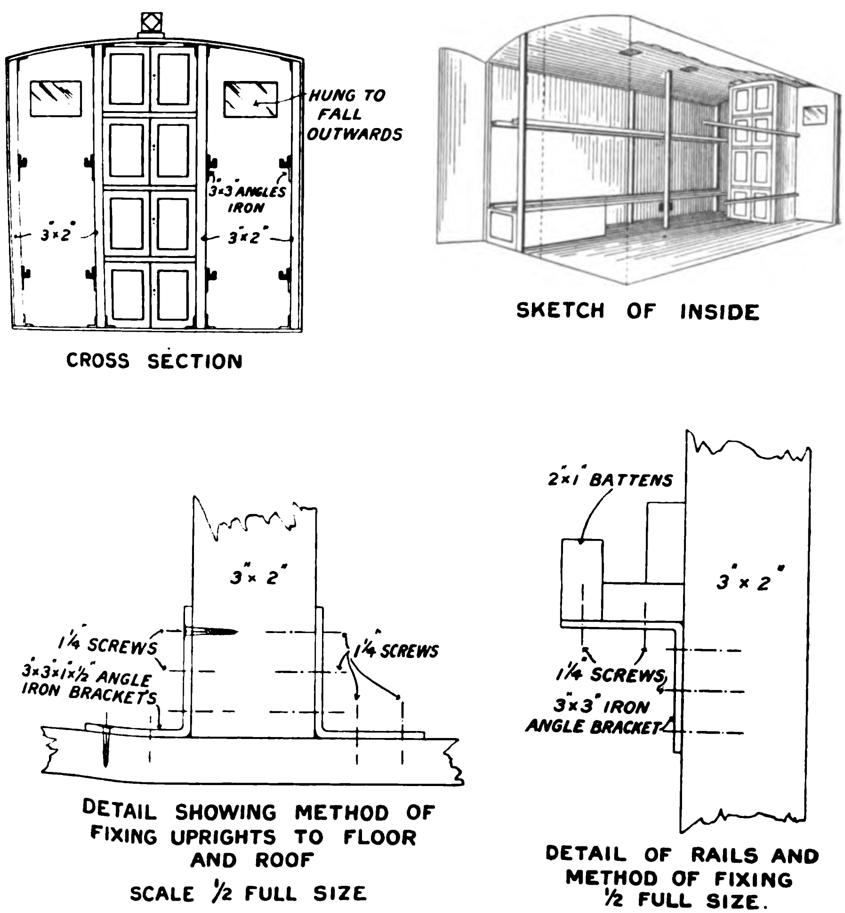
This is satisfactory if the officer in charge of supplies does not require to use them to convey local purchases to the supply park.

As, however, it is extremely unlikely that a constant flow of general service wagons would be available, schemes must be made for utilizing other vehicles.

Many suggestions have been put forward for converting all kinds of vehicles for this purpose. Major W. E. Hudleston, R.A.M.C., writing in the Journal for April, 1911, on the "Adaptation of Civil Vehicles for the Carriage of Wounded," mentions the use of omnibuses and the ordinary furniture van; it is with the latter I propose to deal. There are various sizes of these vans (both motor and horse drawn), and for the purpose of setting forth my ideas I have selected a medium-size van, 15 ft. 6 in. by 7 ft. by 6 ft. A van of this size could be fitted up to carry eight lying on stretchers, or four lying down and twelve sitting up, or twenty-four sitting up. The suggested method of adaptation will be readily understood by looking at the diagrams.

The conversion could be easily accomplished by a carpenter, or

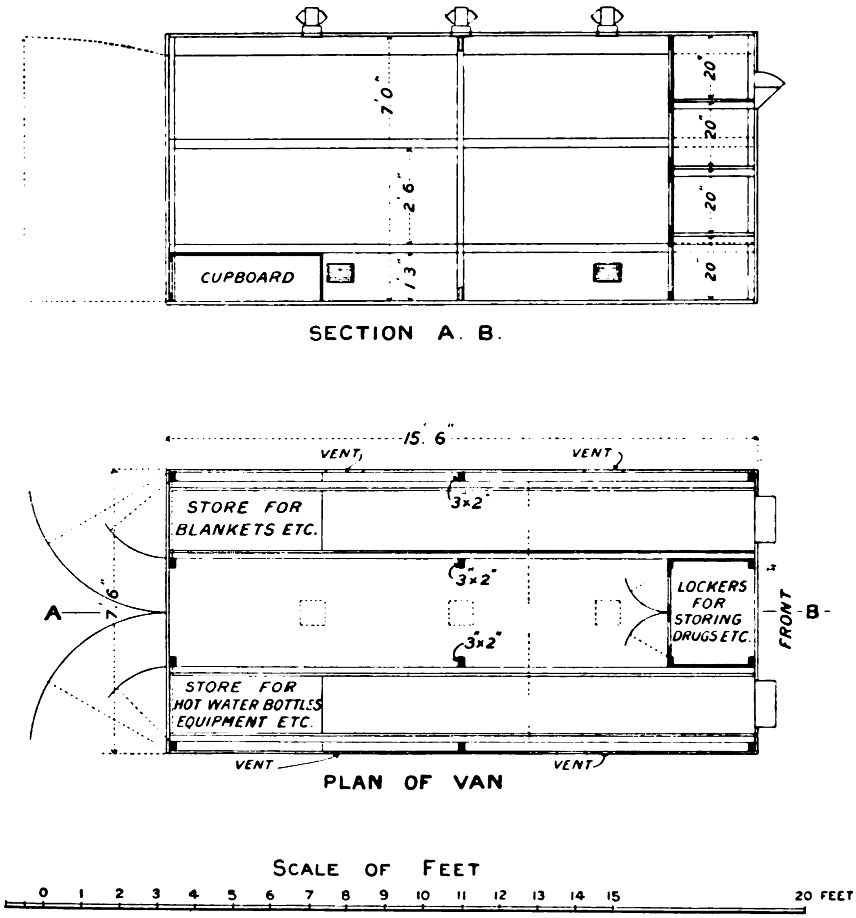
a man used to tools, with some 3 in. by 2 in. timber, iron angle brackets and screws. The uprights are fixed to the roof and floor of the van by means of angle stays kept in position by screws; the grooved rails on which the stretchers rest are held up by short angle brackets; the cupboards or lockers could be fitted up from the ordinary



Adaption of Furniture Van as Clearing Ambulance Wagon, by Staff-Serjeant W. Merchant, R.A.M.C.

packing cases received from the Army Medical Stores, Woolwich (or, if time permits, a series of cupboards could be constructed), and would be found most useful for the storing of medical comforts, dressings, instruments, documents, or anything which it is deemed necessary to keep in a place of safety. The top ventilators should be on the

torpedo principle. Front windows to suit requirements, and louvre ventilators should be fixed along the bottom side under the lower stretcher. In addition, I would recommend a skylight to the roof, or two small electric lights, as the far end of the van is rather dark. Storage for patients' equipment is found under the bottom row of stretchers, care being taken not to block the ventilators;



ADAPTION OF FURNITURE VAN AS CLEARING AMBULANCE WAGON.

lockers, accessible from the outside, for blankets, water bottles and bed pans can be made. A water tank could be carried on top or fitted in place of one of the lockers in the far end; many other useful additions would suggest themselves to anyone working a van after a very few journeys.

Given four such vehicles (motor) fitted up on these lines to work in the evacuating zone, we should find the question of clogging greatly diminished; they could be used between the field ambulances and clearing hospital during an action; or, if necessary, work between the evacuating zone and distributing zone; they could be utilized to move the equipment of the clearing hospital forward as the field ambulances advance.

To convert an ordinary van, without lockers or ventilators, the following would be required: Twelve uprights, 7 ft. × 3 in. × 2 in.; twenty-four battens, 15 ft. 6 in. × 2 in. × 1 in., to form rails; sixty iron angle brackets, 3 in. × 3 in. × 1 in. × ½ in. (¼ in. would do); thirty-six dozen screws, 1¼ in., for fixing brackets and making rail.

If the sides of the van are sufficiently strong, the brackets may be screwed thereto, thus saving six uprights.

INTERESTING CASES OF ABDOMINAL SURGERY.

A CASE OF ABSCESS OF THE LIVER.

By Captain R. H. BOTT.
Indian Medical Service.

J. H. E., a European, aged 40, with twenty-one years' service in India, was admitted to the Station Hospital, Quetta, on December 17, 1909, complaining of great pain over the region of the liver.

History of the Present Condition.—Patient stated that he first noticed a pain over the region of the liver on December 8, 1909, it lasted about half an hour. Four days later he had a slight feverish attack with shivering and sweating, the next day he had another rigor and profuse sweating. There was no history of dysentery.

Condition on Admission.—He complained of great pain in the right side over the region of the liver. The application of hot fomentations relieved this temporarily. Temperature, 101·6°; pulse 84; respirations 20. The following morning his temperature was 99° F. On examination no enlargement of the liver was made out, and no tenderness over the hepatic area. There were some small crepitations at the base of the right lung. That evening his temperature rose to 101° F., he had a rigor and became very collapsed. His blood was examined for malarial parasites with a negative result. December 19, 1909: Pulv. ipecac., gr. xx, administered. Suspicious pleuritic rub on examination of base of right lung. December 23, 1909: Condition has remained much the same, he still has evening fever up to 100° F. A differential leucocyte count showed a slight polymorphonuclear increase. December 26, 1909: More marked signs of pleuritic effusion at right base. Temperature now normal. December 28, 1909: Needle of hypodermic syringe introduced into base of right pleural cavity, several drachms of clear serous fluid

escaped. Fomentations applied. January 10, 1910: Patient still getting evening fever. The right pleural cavity was aspirated, and 30 oz. of slightly blood-stained serous fluid were withdrawn. Patient felt better after this, but had a good deal of coughing during the night and expectorated a considerable quantity of blood-stained, frothy, pus-like sputum. January 25, 1910: Condition of chest much improved, only slight râles now heard at right base, and a much better air entry into base of right lung. There is still much dark, pus-like sputum; it was examined for tubercle bacilli but none were found. The character of the expectoration suggested that it probably came from the liver. January 30, 1910: Condition practically unchanged, still coughing up large quantities of dark sputum. Temperature ranging between 97° and 101° F. February 12, 1910: The chest is dull in front up to right nipple, resonant behind; he occasionally perspires a good deal, and does not sleep well owing to his incessant cough.

Exploration.—February 14, 1910: I saw the patient for the first time to-day. He looked very ill, was very emaciated, his skin was of a sallow, earthy tint, he was constantly coughing and bringing up large quantities of frothy pus the colour of anchovy sauce, and typical of the pus from a tropical abscess of the liver. He had irregular intermittent pyrexia, his pulse was 104 per minute and very small. The liver dullness appeared to be slightly increased upwards in the right nipple line, normal posteriorly. Coarse râles and moist sounds were audible over the lower part of the right lung anteriorly. I decided to explore the liver for pus with an aspirating needle. Owing to the extremely serious condition of the patient a general anæsthetic was deemed inadvisible; eucaine was injected subcutaneously immediately below and anterior to the angle of the right scapula; a small incision was made through the skin and the aspirating needle passed through the wound into the liver; the liver was thoroughly explored, but no pus could be found. The patient passed a bad night and coughed up a large quantity of pus.

Second Exploration.—February 18, 1910: I was asked to see the patient again to-day, and on examination found a cone-shaped area of dullness extending upwards from the liver dullness anteriorly, to above the level of the right nipple. Under local anæsthesia as before, I passed an aspirating needle into the lung in this dull area, and immediately tapped an abscess and aspirated 18 oz. of pus the colour of anchovy sauce. The dullness over this area immediately disappeared, and there were signs of a large cavity in the lung. The patient passed a good night, had very little cough and practically no sputum, and on the morning of the 19th his temperature was normal.

Operation.—February 19, 1910: To-day, under chloroform anæsthesia, I excised 1½ in. of the sixth rib immediately below the right nipple, opened the abscess cavity in the lung, and introduced a large rubber drainage tube—a considerable quantity of thick reddish pus escaped.

On the patient being put back to bed, the drainage tube was connected with a rubber tube leading to a vessel placed beneath the bed; this drainage acted well. Lieutenant Orr Wilson, R.A.M.C., under whose charge the patient then was, notes that the patient now made a rapid and continuous progress towards recovery. He was discharged from hospital on March 24, 1910, with the incision practically healed, no discharge, and he had gained nearly 2 st. in weight since the operation. From March 6, 1910, to March 14, 1910, a small quantity of bile was present on the dressings over the wound when they were removed daily.

I think this case is interesting:—

(1) From the somewhat unusual position in which the abscess was opened and drained. Although Rendu in his table, quoted by Manson, gives the lung as the commonest position in which an abscess of the liver ruptures spontaneously, still it is not usual to find the signs of the pulmonary abscess most marked in the front of the chest.

(2) The common experience that after spontaneous rupture of a hepatic abscess, pus is not found on exploration of the liver with an aspirating needle.

(3) The large size of the pulmonary abscess. When I first saw the patient he was coughing up nearly two pints of pus in the twenty-four hours.

(4) The pleural complication—a dry pleurisy at the base of the right lung is very common in conjunction with an abscess of the right lobe of the liver pointing upwards; a pleural effusion is not nearly so common, and is apt to mislead one, in that either the case is thought to be one of pleural effusion only, or that the hepatic abscess has ruptured into the plural cavity in a patient whose symptoms have pointed strongly towards hepatic suppuration.

(5) Owing to the pleurisy and the fact of the pulmonary abscess having existed for some time before it was opened, the parietal and visceral layers of the pleura were adherent in the situation where the abscess was opened, so that pneumothorax did not result.

(6) The rapid and complete convalescence of the patient after the pulmonary abscess was drained.

RETRO-PERITONEAL TUMOUR.

By Captain R. H. BOTT.
Indian Medical Service.

Sepoy S. S., 14th P.W.O. Sikhs, aged 30, thirteen years' service, was admitted to the Combined Indian Troops Hospital, Quetta, on May 25, 1910, suffering from epilepsy.

History of the Present Condition.—Patient stated that he had suffered from fits at intervals for about nine years; they never occurred when he was on military duty. On the day previous to admission he had a typical

epileptic fit in the lines. He stated that the fits had occurred much more frequently during the last six months than formerly.

Past History.—Epilepsy; duration nine years. Over-indulgence in alcohol. Nothing else of importance elicited.

Condition on Examination.—Patient thin and wasted, muscular powers much reduced. Slightly anæmic. Tongue clean, bowels regular, slight evening pyrexia up to 99·4° F.

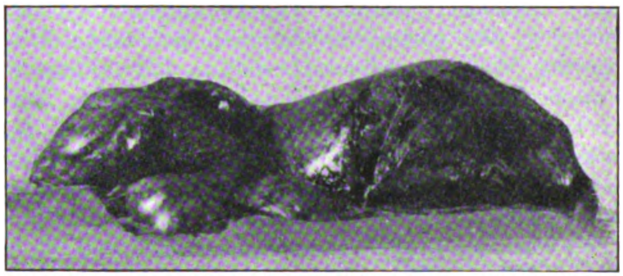
The abdomen is unduly prominent, the superficial area of liver dullness is diminished, and both the liver and heart appear to be displaced slightly upwards. Liver and spleen not palpable. Flanks dull on percussion.

Potasii bromidi, gr. xx., t.d.s., ordered.

May 30, 1910: Patient does not sleep well, inclined to talk irrationally at night. Temperature rose to 101° F. last night. Passed four loose motions this morning containing some mucus. At 3.30 p.m. he passed into a cataleptic condition, muscles flaccid, tendon reflexes absent, pupils dilated, breathing slow; pulse 116 per minute, regular, of good volume and tension. He remained in this condition until 10.30 p.m., then roused, and early the following morning became violently delirious; potasii bromidi ʒi. was given. Abdomen has become larger, percussion note is now resonant all over except in hypogastrium. Liver dullness extends up to fourth rib in the nipple line. June 1, 1910: Another cataleptic attack, lasting seven hours. Patient has no recollection of these attacks. June 13, 1910: Patient seems better, abdominal measurements vary slightly from day to day, girth at level of umbilicus ranging between 35 in. and 38 in. Paracentesis performed to-day in linea alba below umbilicus, but no fluid was obtained. June 20, 1910: I saw the patient; beyond the enlarged rather flabby abdomen nothing abnormal could be made out. Patient is still getting slight evening fever, urine normal. An exploratory laparotomy was suggested, but the patient would not agree. July 7, 1910: On deep palpation in the left hypogastrium a soft rounded swelling with ill-defined edges, the size of a small cocoa-nut, can be felt. There is a feeling of resistance on deep palpation in the right hypogastrium, extending upwards in a line with the outer edge of the right rectus muscle. The swelling in the left hypogastrium appears nodulated in places. July 11, 1910: Both Calmette's and von Pirquet's tuberculin reactions were tried with negative results. There has lately been slight morning diarrhœa. July 15, 1910: Slight bronchitic attack. The hypogastric swelling is more distinct and nearer the surface, and the resistance in the right hypogastrium has developed into an ill-defined swelling. It was thought that the swelling might arise from the bony wall of the pelvis; per rectum there was nothing abnormal to be felt. As the patient is still getting evening pyrexia, the blood was examined for malarial parasites with a negative result. A differential leucocyte count was normal. August 2, 1910: Patient is getting weaker, the abdomen has increased in size and the swelling first noticed in the

hypogastrium has apparently extended into the abdomen, but its exact connections cannot be made out. There are no signs of peritonitis and no obstruction of the bowels, urine is normal. He has gained a little in weight during the last month. He now has a moderately high remittent type of fever ranging from 100° to 103° F. Cough still troublesome. August 3, 1910: Patient has consented to an exploratory operation. He is very weak but his pulse is fairly good, though rapid (116 per minute). On palpation large soft doughy masses can be felt occupying the greater part of the abdomen; the bowels are freely open. August 6, 1910: I performed an exploratory laparotomy assisted by Lieutenant Jolly, I.M.S. Anæsthetic, chloroform. Incision, linea alba from slightly above pubis to umbilicus. On opening the peritoneal cavity the whole abdomen was found to be occupied by an enormous retro-peritoneal swelling extending from the pelvis to the diaphragm; the bladder was pushed to the right side of the pelvis. The movable abdominal viscera were in the right hypochondrium immediately beneath the liver, which with the diaphragm was markedly displaced upwards. The swelling had pushed the peritoneal covering of the posterior abdominal wall forward, and it was adherent to the bladder, abdominal wall in left hypogastric region, transverse mesocolon, liver and posterior abdominal wall. The abdominal incision was enlarged almost up to the ensiform cartilage. A trocar was thrust into the swelling, but no fluid found. It was found impossible to remove the tumour complete owing to the extensive attachments of its capsule, and an effort was then made to enucleate the swelling from its capsule. This was found to be easier than expected, and the tumour was eventually removed in four principal masses; there was not much hæmorrhage. The tumour appeared to be a fibro-lipoma, the portion which was first noticed as a swelling in the left hypogastric region was harder than the remainder, and on incising this portion it was evident that there had been hæmorrhage into this part of the tumour at some earlier date. There was some difficulty in stopping bleeding after removal of the swelling from the posterior abdominal wall, which appeared to be the main attachment of the tumour; the main vessels at this place were ligatured and the space formerly occupied by the swelling was flushed out with hot sterilized normal saline solution. The peritoneal covering of the tumour was then closed above and below, a small piece in the middle being left open and brought up to the abdominal skin incision, and anchored there for drainage. The abdominal skin incision was closed by means of a single layer of interrupted salmon gut sutures, passing through skin, fascia and peritoneum, a small opening being left in the centre of the incision for the purpose of draining the retro-peritoneal cavity. The removed tumour weighed 35 lb., and was just too large to go into an empty kerosin oil tin. The patient recovered satisfactorily from the operation: he was given hot coffee per rectum shortly after the operation, and later in the evening two pints of normal saline solution per

rectum. He had a troublesome cough during the night, which caused him a good deal of pain. August 7, 1910: Patient feels much better, no pain except on coughing, which is very frequent. Temperature normal; pulse 104, of good volume. Abdomen quite soft and moving with respiration. Slight serous discharge from drainage tube. Bowels open once naturally. Urine passed naturally. Towards evening pulse and temperature began to rise, cough became troublesome, and a few crepitations could be heard at the bases of the lungs. August 8, 1910: Patient had a bad night, cough very distressing, and has difficulty in expectorating accumulations of mucus from larynx and trachea. He is taking liquid nourishment freely every two hours, and stimulating expectorants for his bronchial trouble. This morning his temperature is 101° F.; pulse 136 per minute, and rather weak. Both lungs are full of moist sounds, and numerous crepitations are to be heard at both bases. The abdomen is quite soft and free from pain and the abdominal wound looks healthy and



is quite clean. Patient died suddenly at 4.30 p.m. from respiratory failure, owing to the large accumulation of mucus in the bronchi. This patient was interesting in view of the fact that (1) he was admitted for epilepsy which had commenced rather late in life, there was a strong alcoholic history, and the patient had not noticed that his abdomen was getting larger; (2) the peculiar cataleptic condition into which he fell on two occasions after admission to hospital; (3) the rapid growth of the tumour; (4) the large size of the tumour; (5) the difficulty of coming to a correct diagnosis of the nature and origin of the abdominal swelling; various diagnoses were postulated, including a tumour arising from the bony walls of the pelvis such as a chondrosarcoma, &c., chronic peritonitis, possibly tubercular in origin, and a retro-peritoneal tumour; (6) the cause of death: before operation there was some bronchitis, and the sudden removal of so large a tumour from the abdomen relaxing the pressure exerted through the diaphragm on the bases of the lungs undoubtedly contributed to the pulmonary congestion which supervened. The photograph of the tumour was taken shortly after removal.

Lecture.

A LECTURE ON MOBILIZATION.[1]

By Lieutenant-Colonel E. M. WILSON, C.B., C.M.G., D.S.O.
Royal Army Medical Corps (R.P.)

The mobilization and formation of medical units and *all matters connected therewith* is a very big subject. Our work at the Record Office is concerned entirely with men, and I hope you will excuse me if I devote the greater part of the time at my disposal to the provision of personnel and leave the consideration of the very important questions regarding transport and equipment, both medical and ordnance, till the end, thus keeping the two subjects of men and material separate.

In the first place, then, what are the duties which are, or should be, performed by the Record Office and the Officers Commanding Royal Army Medical Corps at home for the proper provision of Warrant and N.C.O.s and men on mobilization?

I do not think it will be necessary to travel outside the scope of those two little pamphlets, the "Regulations for Mobilization" and "Mobilization Instructions, A.M.S." Though small there is a good deal to be learnt from them, and if I mention some facts which are well known to you I hope you will forgive me because I find from correspondence, both official and unofficial, that other officers are not so well informed.

Perhaps, like a minister in a pulpit, I might discuss the subject under three heads, viz.: the Record Office, the Officers Commanding in times of peace (and in this description I beg respectfully to include all administrative medical officers as well as the Officer Commanding a company), that is in the words of the "Regulations for Mobilization," "an Officer Commanding a Regimental Depot or Company, Royal Army Medical Corps" (paras. 174-185), and the Officer Commanding the medical unit which is to be mobilized (paras. 186-220). Each of these might be divided into "preparation in peace time" and "action on mobilization"; and I will take the Record Office first, because though it affects me most, it is probably less interesting to you, and because after all the Record Office must be the basis or foundation on which mobilization, so far as it relates to personnel, is built.

Our duties in connection with mobilization are mainly three: (1) To keep in touch with all reservists, so as to make sure they will be available when mobilization is ordered; (2) to allot them to medical units in accordance with "Mobilization Instructions, A.M.S."; and (3) to

[1] Delivered at the School of Army Sanitation, Aldershot, December 7, 1911.
[Note.—The references are to the Mobilization Regulations, 1909.—Ed.]

prepare and issue as soon as possible a list of promotions of qualified men to complete the establishment of the units mobilized.

I do not think I need trouble you with the details of our work in time of peace, though I should be very pleased indeed to explain the routine of the office to any officer on any afternoon at the Record Office.

The reservists (there are 5,000 of them) notify every change of address, and envelopes properly addressed are kept ready for issue with railway warrants and instructions where to join. The men die, or are invalided, proceed to sea or to the Colonies, take their discharge, sometimes, like other people, get into prison, and as casualties occur their places are filled by others, the alterations being notified on Corps Form 19 to all Officers Commanding where reservists are required to join.

If there are any unallotted to medical units they would join the Depot as "reliefs and miscellaneous."

Whenever the order to mobilize is issued those envelopes containing complete instructions to each reservist are *posted* and then we set to work to make as many promotions as are considered necessary, from our seniority rolls. When this has been completed our job so far as the provision of personnel is concerned is *done*, and I rather wish to emphasize this as I fancy there is a prevailing idea that when mobilization is ordered any deficiency in personnel in any unit can be made up by telegraphing to "the Records."

This idea so far as it exists is no doubt due to the fact that in Table III of "Mobilization Instructions, A.M.S.", you will find in nearly all units a certain number of Warrant and N.C.O.s and buglers shown in italics as "provided by Officer in Charge Records."

These numbers total up to 294 Warrant and N.C.O.s and 55 buglers, and I am quite sure when officers come to think of it they will realize that we do not keep these men and boys locked up in a secret drawer to be issued on mobilization.

Every recruit as soon as his course at the Depot is finished, and every N.C.O. or man returning from foreign service, is *posted* to some station at home, and wherever they are, whenever mobilization is ordered, there they will be badly wanted, and it will be no use attempting in the few days which will elapse between mobilization and the embarkation of the first units, to shift N.C.O.s from Aldershot to Netley or from Chatham to York, robbing Peter to pay Paul.

The units will have to embark with the N.C.O.s they have got actually present at each station at the time, plus the number of N.C.O.s and privates qualified for higher rank pending the issue of promotion lists which will be prepared and printed as soon as possible. In order to make this procedure quite clear we obtained permission from the War Office to issue a circular to all Principal Medical Officers and Administrative Medical Officers to that effect.

The N.C.O.s "provided by Records" on mobilization are provide

solely by *promotions*, and if you will look at the last row of figures for each station in Table IV, "Mobilization Instructions, A.M.S." you will see that these N.C.O.s and men remaining after Units have been provided for, are for "promotions to Field Army, Principal Medical Officer's clerk, and duty at home."

As regards buglers any surplus will be posted from the Depot and probably qualified boys will be enlisted from the Royal Schools as was done in the South African War.

I do not think I need bother you further with the Record Office. Of course the documents of all reservists will be sent to the Officer Commanding the mobilized unit forthwith, and there will subsequently be a great deal of paper work in connection with Separation Allowance, Allotments, Remittances and Medals, to which I will briefly allude later.

Now what is the position of the Officer Commanding at a station where Medical Units are ordered to mobilize, in times of peace as regards *preparation* for mobilization? And perhaps it may not be amiss to say a word as to how these units are constructed.

All Medical Units, whether Field Ambulances, Stationary or General Hospitals, &c., have been most carefully built up at the War Office on the basis that there shall be in each: (1) a proportion of fully trained N.C.O.s and men, i.e., serving soldiers; (2) a proportion of those who *were* fully trained on passing to the Reserve, i.e., ordinary Regular Royal Army Medical Corps Reservists; and (3) a proportion of partially trained men including Special Reservists, Category "A" and "B" and Infantry and Royal Garrison Artillery Reservists transferred to Royal Army Medical Corps under Special Army Orders of 1909 and 1911.

If you will look at any unit you like in Table III, you will find that this is the method adopted.

The proportion of partially trained to fully trained men varies according to requirements, being larger in Field Ambulances where stretcher bearers are required and smaller in General and Stationary Hospitals.

Now as regards these reservists it seems to me that the only duty which is required of an Officer Commanding a station in times of peace (and it is a most important duty) is to see that the clothing and boots are ready and that they *fit*. We all know that there are few things more important to the soldier than the boots he marches in, and some years ago when magnitudes were introduced as well as sizes we sent special instructions to every reservist to get his feet measured, and the dimensions are now recorded on all Corps Forms 19. These forms contain all particulars of all measurements of clothing, &c., and are in the possession of all officers where reservists assemble, and corrections are sent out generally once a month as casualties occur. Perhaps I might suggest, though it is not official, that when indenting for garments and boots the Officer Commanding might make a fair allowance for growth.

The Infantry Reservists come up biennially and we have asked that in all cases they might be remeasured and the results sent to our Office. The Special Reservists (Category A) come up every year and I hope next year to ask all Officers Commanding concerned to give us fresh measurements; but as regards our own Royal Army Medical Corps Reservists we do not get the opportunity, and as it seems very probable that they have expanded in all directions since they went to the Reserve it might be a good idea to allow for this.

There are also stamps to be provided for marking equipment, &c., I would ask all Officers Commanding, "Is everything ready?"

Another point which occurs to me is the position of the mobilization stores and the means of access. Remember that in Aldershot alone when the time comes there will be 2,035 reservists arriving at once, 1,431 for the Depot, 291 for the Cambridge, and 213 for the Connaught. Imagine all these men clamouring for boots and clothing at once. I remember when I was Company Officer for 18 Company many years ago the clothing store was on the third storey of a building in St. George's Barracks, with only one door and one staircase. Picture to yourselves the position of a Quartermaster and his subordinates trying to clothe a large number of men under these conditions and the men trying to get into uniform—everyone in a desperate hurry. I think this is a point which is worth considering in peace time, and I venture to suggest that it might be useful to have a kind of rehearsal from time to time to see how the thing would work in actual practice.

So much for the Reservists. As regards the preparation for mobilization of N.C.O.s and men serving in the various districts, I do not think it would be becoming of me to offer any suggestions lest it should be thought that I was trying to teach my brother officers what they already know much better than I do. They are in daily touch with their men, they command them, they know their capabilities and they have already allotted them in Corps Form I (monthly return) to the positions they would fill on mobilization. I will only invite attention to the obvious fact that the more *trained* men there are at a station whenever mobilization is ordered the more efficient the Medical Units mobilized at that station will be.

Men *trained in all capacities;* first and foremost men qualified for promotion and advancement so as to be ready to step into higher positions in the unit directly the promotion lists are issued, because I can assure you that the number of additional N.C.O.s immediately required will be very large indeed. Our requirements also of trained nurses, cooks, and clerks will be very much greater than the ordinary peace establishment.

You must not expect that there will be a large proportion of trained men among the reservists. There are about sixty corporals and a few serjeants. There is also a steadily increasing number of trained nurses,

and some clerks and cooks, but you must remember that in the great majority of cases they have ceased (except as regards some of the nurses) to exercise their special qualifications in the Reserve and at first they will be a bit rusty.

The best qualified men are, and must always be, serving with the Colours. Only a limited number are permitted to extend each year and therefore naturally the best are kept and those who have *not* qualified are passed to the Reserve.

On mobilization the duties of an Officer Commanding a company, Royal Army Medical Corps, are sufficiently arduous (paras. 174-185, "Regulations for Mobilization"). He recalls all soldiers on leave; he medically examines everybody, including reservists; he clothes the reservists, takes from them their Life, Identity, and Reserve Certificates which he sends to the Paymaster. He sends to the Record Office daily a nominal roll of the reservists who have joined, together with statements of remittances they wish sent to their families and charges against them for messing, &c. He takes into pay any reservists medically unfit, and with these and what is left of his Company, after the units mobilized at his station have been completed, he prepares to continue his daily work assisted by the St. John men sent by the War Office (para. 37). Practically it comes to this, the officer *remaining* in charge of a military hospital where units are mobilized, when he has finished his duties as an "Officer Commanding a Regimental Depot or Company, Royal Army Medical Corps" (paras. 174-185), takes over the duties of an "Officer Commanding Details of a Unit" (paras. 221-226).

In this connection I might draw attention to the register which is kept up at all headquarters of pensioners and ex-soldiers resident in the neighbourhood who are willing to serve at home when mobilization is ordered. There will necessarily be a great demand for ex-N.C.O.s capable of acting as dispensers, stewards, packstore keepers, cooks, and clerks, to work the military hospitals from which the serving soldiers have been withdrawn, and this can hardly be supplied except from men on these registers. I speak from a very vivid recollection of what happened in the hospitals at home during the South African War.

Now let us turn to the "Officer Commanding the Unit" which has been mobilized and which he is going to take abroad, and I confess I have always looked upon an officer in this position with a sort of envy. He has no responsibility in times of peace—he just strolls into barracks and takes command of the unit which has been carefully created for him by the War Office, nursed for him, as regards serving soldiers, by the Officer Commanding the Company, or the Officer Commanding the station, and provided with reservists and special reservists by the Records. Of course he may be appointed to a unit at his own station, and I cannot imagine anything pleasanter than to proceed on active service with

N.C.O.s and men whom one knows personally, but naturally this cannot always be the case. Now what are his duties with his new unit? Paras. 186-220 of the "Regulations for Mobilization" give him plenty of work, and I propose to refer briefly to the various items in the order of urgency, beginning with the men.

(1) He has everyone medically examined over again.

(2) If in consequence of this examination his establishment is not complete he must telegraph to the Record Office for additional reservists. These will be supplied, if possible, from reliefs and miscellaneous at the Depot.

(3) He must send Army Form D, 418 (Separation Allowance) to us at the Record Office, and Army Form O, 1796, allotments of pay to the Regimental Paymaster, No. 2, Aldershot, and this is a very big job, because unless it is done before the unit embarks it will be almost impossible to issue the separation allowances and allotments to the families at home, and great distress will be caused. I should like to suggest that all clerks should be thoroughly instructed in these forms in time of peace, and that at least one competent N.C.O. should be posted to each unit specially for this purpose. It will be a very arduous task for each unit, and it must be done in a very few days.

(4) With Army Form O, 1796, he sends the Life, Identity, and Reserve certificates of all reservists to the paymaster, if this has not already been done.

(5) He sends all the medals, and the wills of soldiers (if they so desire) to us at the Records, also any books or documents not required by the unit.

(6) Having started some trustworthy N.C.O. on these tasks I would suggest that as soon as possible he should examine the documents of his reservists, and take stock of what he has got. We have tried as far as possible to apportion *qualified* reservists among the various units, and if the Officer Commanding will look, he may find cooks, sanitary orderlies, and some nurses, also corporals and men who have passed for promotion, who would be most useful to him. He will not have a great deal of time to make these examinations, because as soon as he reaches the port of disembarkation he will have to hand in the duplicate attestations, &c., to the Base Record Office—all N.C.O.s resume their rank, and qualified men may be granted a temporary acting Lance stripe in view of the promotion lists which will be printed. As it is practically impossible that these could be issued before the force embarks, any N.C.O.s or men qualified for promotion among the reservists will be of the greatest value to the Officer Commanding; and let me impress upon him that this examination of documents must be made before embarkation or during the voyage, for he will have no chance afterwards.

Now let us leave the men and give the short time that remains to us to the very important subjects of transport and equipment; and you will

see why I have left this to the last, because it only concerns the Officer Commanding the unit on mobilization, and not until mobilization actually occurs.

As regards transport, the ambulance and general service wagons are stored for all units, but I have been asked by officers, both personally and by correspondence, official and private—where do we get our horses? and who is to fetch them? The horses are provided by the Remount Department at various centres in different Commands under General Officers Commanding-in-Chief (para. 39-41). I am quoting from "Regulations for Mobilization, 1909," and must be telegraphed for to the General Officer Commanding-in-Chief, stating numbers (see para. 62).

The Officer Commanding a field ambulance will on receipt of instructions from General Officer Commanding-in-Chief send a party to *fetch* them. This party will take with them for this purpose head-collars, head-ropes, bits, &c. (para. 215). Very good, but who are you going to send? The Royal Army Medical Corps, as a rule, are not expert horse-masters. First, remember that the Officer Commanding will have 59 N.C.O.s and men of the Army Service Corps attached, 40 in the case of a cavalry field ambulance, and by para. 39 these Army Service Corps *will be sent* to the unit to which they are attached at its place of mobilization as soon as the men have passed the medical examination and have been clothed. You have not to apply for them, they *will be sent to you* and obviously as these men will have charge of the horses they should be detailed to fetch them. You have the head-collars, &c., in your equipment; but in case the Army Service Corps Detachment have not yet arrived and you are told to send for your horses, para. 44 provides that General Officers Commanding-in-Chief "will arrange for temporary assistance to be rendered from mounted corps in their Command to such units as may have difficulty in finding parties to take over these animals on mobilization." I think as regards field and cavalry field ambulance the procedure of the Officer Commanding is quite clear.

To move the heavy ordnance equipment of a general or stationary hospital is not so easy. I think it must be taken for granted that as it cannot be moved by the Staff, application must be made to the General Officer Commanding, though possibly if the horses of a field ambulance are available they may be lent (and in all probability would be ordered), to assist in the task. (See also para. 61). The equipment will be drawn under local mobilization orders (see para. 26). So much for the horses.

Equipment.—So far as medical and surgical equipment is concerned, the Officer Commanding will have no trouble. Para. 21, "Mobilization Instructions, A.M.S." lays down that it will be *forwarded*, no requisition being necessary, addressed to the Officer Commanding at the place of mobilization and the medical comfort panniers will be issued in like manner, para. 24.

As regards ordnance equipment this must be drawn in accordance with the time-table shown in local mobilization orders (paras. 210 and 26, "Regulations for Mobilization"). For this no doubt a party will be required to assist, which must be furnished from the unit mobilizing (see para. 211).

Examination of Table III, "Mobilization Instructions, A.M.S.," will show that every detail has been most carefully thought out.

In the field units; cavalry and field ambulance, in almost every case all the equipment is stored at the place of mobilization. In the Lines of Communication units, stationary and general hospitals, the unit mobilizes where the ordnance equipment is stored, and the medical equipment and comfort panniers are sent from Woolwich without requisition.

Echoes from the Past.

THE SANITARY CARE OF THE SOLDIER BY HIS OFFICER.[1]

BY BRIGADE-SURGEON LIEUTENANT-COLONEL G. J. H. EVATT, M.D.
Army Medical Service.

IN beginning the lecture I would say that it was not by my initiative that I was put forward to deal with this matter. I think myself that the wording of the notice to give a lecture implies that the lecturer should himself be a master of the subject. I would prefer rather to say that we are here having a conference, and if you will allow me to be the opener of the conference I think that would be the better expression.

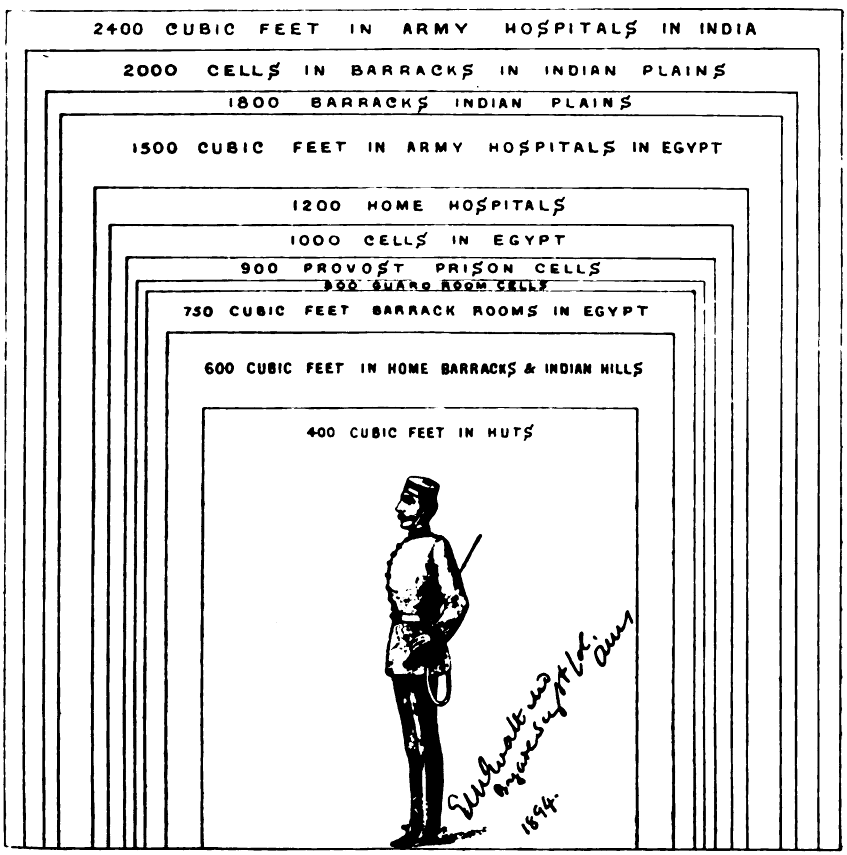
We are met from different branches of the Army to contribute our various items of information to the one great question of how the soldier is to be pushed forward on the road towards health and fitness, so that the one great thing for which he exists, namely, his fighting power in the field, may be more and more developed. I propose, then, this evening to deal with the subject in three ways: First, to glance at the sanitary history of the Army briefly up to the present day; secondly, to speak of the sanitary ideals which we specialists in the medical service have before us for the

[1] A Lecture delivered at the Royal Artillery Institution, Woolwich, January 29, 1894.

soldier; and, thirdly, to consider how far the executive commanders of the troops themselves are to co-operate in this work.

I would say that all through the last century the Army was very small in point of strength. There were numbers of regiments con-

THE ENGLISH SOLDIER'S "RATION OF AIR."



SHOWING THE AMOUNT OF CUBIC SPACE ALLOWED TO THE SOLDIER IN BARRACKS, HOSPITALS & PRISONS THROUGHOUT THE EMPIRE

tinually being raised for special purposes, and as soon as the campaigns for which they were raised were over they were brought home and broken up. Nothing is more curious than to trace the history of our regiments to the present day; they have got the names, and sometimes the numbers, of regiments that were broken

up long before. It was not until the outbreak of the old French war at the time of the French Revolution, and from then to Waterloo, that the Army was of any great strength in England. But during all that time the number of barracks constructed was not very many, and large numbers of troops were encamped along the South Coast in temporary constructions. The moment that Waterloo was fought, and Napoleon was crushed, the English Government at home set to work to cut down the military expenditure, and I think that anyone who studies the history of the Army between 1815 and 1854 will say that a darker period could not possibly exist than during that time. There was a very harsh discipline governing the Army, the soldiers were shockingly badly lodged, they were very badly dressed and very badly fed during the forty years of that dark era of the service. I cannot see one glimmer of light through the whole of it, except one thing, and that was that you had here in Woolwich, in the Royal Military Academy, a military school which was keeping alive the light of military scientific proficiency. I think myself that the more an army drifts away from war experience the more it drifts away from the road to efficiency. The moment Napoleon was crushed an era of peace seemed to be quite fixed, and what did you have? You had the uniform of the Army becoming an absolutely impossible one. It was the long peace that gave the bearskin to the guardsman that he did not have at Waterloo; it was the long peace that gave the steel cuirass to the Life Guards that they did not have at Waterloo; it was the long peace that gave us the regimental contract system by which the soldier was robbed very often of his food and cheated in his clothing, and the whole of that time was a thoroughly bad time, and as the result of that wretchedly bad era there came in 1854 the tremendous crash and sufferings of the Crimean War. The whole of the modern efforts of sanitation in the Army dates back to the break-up of that long peace system by the Crimean Campaign. In those barracks in the old days (and I myself have met men who remember them) the soldier did not sleep in the barrack-room as he does to-day in a bed by himself, he slept in bunks up along the wall, on shelves, two in a bed; and you can quite imagine how a conservative officer in those old days might have thought that in giving the soldier a separate bed he was making a step towards mollycoddling—a word that is most wrongly used in regard to the officer's life. I would protest at the very beginning against the use of that word. Whenever it is used by any officer of his men, or of the soldier generally,

it is sure to be by one who knows little or nothing about these men. I saw the other day that an officer of the native army in India had been using the word "mollycoddling" towards the English soldiers, and by so doing he showed that he knew nothing of the hardships and strain under which the soldier passes his life. So far from being mollycoddled, I think that just as a well-clothed and well-housed and well-fed officer goes to war to beat the soldier in everything he does, so the more we develop the soldier's fitness in peace, so far from making him unready for war we make him more fit for war. During the whole of the long peace, when the Army was doing the impossible old style of drills, and was going about dressed in an impossible dress, and when everything on the parade ground seemed so beautiful in the way of turn-out, the soldiers were dying in a wretched condition in overcrowded and unsanitary barracks. The death-rate of the splendid guardsmen in London was something painful; they were dying mainly of consumption at the rate of 20 per 1,000 per year, a dreadful rate; that is to say, the guardsmen were dying at double the rate of the policemen. The policeman working night by night over the city streets and doing heavy work was twice as healthy a man as the guardsman doing his duty as sentry over the various public buildings. In the general infantry the death-rate was about 15 per 1,000 and in the cavalry it was somewhere about 18 per 1,000, while on the nation as a whole it was only about 10 per 1,000.

All this bad epoch for the Army went on until the crash and disaster of the Crimean Campaign, and then the nation for the first time woke up to the question of the medical care and sanitation of the Army; and a Commission was established, called the Barrack Commission. That Commission went very thoroughly into the whole question of the soldier's life and his housing; they published a report, in which they showed that the overcrowding of soldiers was most scandalous, and that their death-rate was excessive; and, amongst other things, they gave power to medical officers for the first time, in the year 1858, to make sanitary recommendations to Commanding Officers on all matters referring to health. Although much has been done since 1858, I desire to place on record that for eighty years and more before 1858 the Medical Officers of the Army had been struggling to develop sanitary reforms in the soldier's clothing, feeding, housing and surroundings, but had failed to effect anything, purely from their weak official status in the Army. If you read the books of Dr. Robert Jackson and others which were published last century, they seem as though they might have been

written yesterday, so rational, so common-sense, so up-to-date are their ideas as to the above subjects. But the Medical Service during that long peace had no power whatever to make recommendations, and although the regimental medical system was existing with so many medical officers and surgeons in regiments they had no power to say one word as regarded the sanitary protection of the men's health; and it was not until the year 1858 that the Royal Warrant was issued, to which I have referred, and the words of which seem to me so important that I quote them here: "The officers of the Army Medical Staff are charged not only with the medical care of the sick, the administration of the military hospitals both in peace and war, and the command of the Medical Staff Corps, but with the duty of recommending to General and other Officers Commanding, verbally or in writing, any precautionary or remedial measures relating to barracks, encampments, garrisons, stations, hospitals, transports, diets, dress, drills, and duties which may in their opinion conduce to the health of the troops and to the mitigation or prevention of disease in the Army." These sentences form paragraph 8 of Part I. of the "Army Medical Regulations." They cover the ground, I think, in a very full manner; but these paragraphs were not put into the "Army Regulations" until after the breakdown in the Crimean War, when public opinion had come to fortify the War Minister in doing so. But you must, of course, remember that in England there have always been two armies, that is to say, one army worked hard-and-fast by the "Queen's Regulations," and another that rational and common-sense army wherein officers and others in the Army do things in a much more common-sense manner. I have no doubt that there has never been a day when the Commanding Officer of a good type has not leaned to a certain extent on the advice of the Army medical officers with whom he has come into contact. I feel sure that there have been such Commanding Officers, and it would be a great mistake for any of the younger school of officers present here to-day to imagine that because the ruinous purchase system was in force and certain bad conditions existed in the old day, it did not produce many excellent and strong Commanding Officers. It would be quite unjust to think that the present men alone are perfect. Many of those officers, although they were not so scientifically trained, were men of great strength of character and had the fullest sympathy with their men; but the times, perhaps, were not so favourable as they are to-day for carrying out reforms. Since 1858 this recommendatory power has been carried on by the

medical officers up to the present day, whether under the regimental or departmental medical systems.

The regimental system of medical aid ceased in 1873, and no doubt sanitary matters fell for a time into the background owing to the change of system in medical organization ; but whatever ground has been lost we must struggle to make good in the near future.

I beg of you to allow me to say that it was absolutely essential for the Army and for us as a military body to withdraw our officers from the various units of battalions and batteries ; it was absolutely essential that we should form our medical officers into a corps which would be ready to do war work. The whole reason for the existence of the Army is not that we may have charming messes or excellent bands, or pleasant social life, be it ever so enjoyable and perfect. England has an Army only for one purpose, and that is war and war efficiency. Once grant me that, and I will show you that every change which has taken place in our medical organization was called for to achieve that aim. I would say to you, and I speak here to an audience largely composed of gunners, that when far away in the last century your great regiment of to-day was broken up into small detached groups of two galloper guns with each regiment of cavalry, and two battalion guns with each regiment of infantry, there assuredly were devoted men even in those past days who dreamt of a better day when the Corps of Artillery would take its true position in the Army. If you can look back with me to that day when, in creating the Horse Artillery, the two galloper guns were withdrawn from every regiment of cavalry, I have no doubt whatever that the cavalry colonel groaned deeply over the loss of them ; and in the same way when the two battalion guns were withdrawn from all infantry battalions the infantry officers no doubt deplored the removal and said, "They have taken away our battalion guns, they have removed our good companions, our cheery friends ; look how uuprotected and defenceless the regiment is left." But you must remember that behind the cavalry regiments and behind the infantry regiments was something more than all the cavalry and all the infantry. What was that? You had the good of the whole Army to think of. What has come out of that removal of the two guns from the great bodies of the cavalry and the infantry? You have developed this great artillery regiment which is able to do more and achieve more for the Army than the old system could have done. I desire to say to you that evolution is working out in the same way about ourselves in the Medical Service. If you look back on our old

medical organization we had, as it were, in each regiment our two galloper guns, viz., the regimental doctors and the little tiny hospital. This weak and subdivided service failed on the Alma hillside in September, 1854, and came to utter grief in the corridors of the great Scutari Hospital in the winter troubles of 1854-1855. Our whole organization to-day is based on the bitter lessons learned in that sad and painful campaign. This enfeebled and divided service could not do its war work, and there is no doubt whatever that while the withdrawal of the medical officers from the various corps and batteries of the Army has caused considerable inconvenience and trouble, you must remember that the men who withdrew them made the change solely in the interest of war efficiency and to put an end for ever to the constant dread of breakdown under the old system when we went into the field. But our war efficiency once assured, it is the whole object and aim of the Medical Service to work in absolute sympathy and perfect brotherhood with the Army as a whole.

We have no hope or dream apart from its welfare in peace and in war, and we desire that every individual in the Army, from the highest officer in its hierarchy to the youngest baby in the married quarters, shall be thoroughly and efficiently cared for, better and more thoroughly than in the best days of the regimental system.

But we cannot give up our corps organization and our autonomy for field work because we exist for war, that we may have an organization which we can go out to in the field without the feeling that there is a constant risk of breaking down. Our station hospitals are far better medical organizations than were the old regimental hospitals; and there is no difficulty whatever in developing a perfect medical staff to care for officers, their families, and the women and children of the Army, if only we receive a free hand and sympathetic aid in organizing this branch of our work.

If, in our devotion to the development of our garrison hospitals, sanitary work may seem to have taken a secondary place it is in no ways our intention nor our aim. We are before all things sanitarians and prevention is our watchword, and there is no difficulty whatever in carrying it out under our present unified medical system of organization if only we determine to work jointly with the intention to succeed.

We desire to do a fuller sanitary work for the soldier than ever the best regimental doctor of the past system did for his regiment, or battalion, or battery, and it is perfectly feasible. Let us consider, then, how the Medical Service working as a unified corps

carries out the sanitary care of the soldier's life, and what is the routine of a sanitary officers' duties. Let us take any large English or Indian garrison and study its sanitary organization so far as we the Army Medical Officers are concerned. Although it has been necessary to remove the medical officers from regiments, still we allot one medical officer to each regiment, corps, or barracks, and he fulfils, or ought to fulfil in the fullest degree, the duties of the old regimental medical officer, so far as the sanitary needs of the soldier is concerned. So far as such officer has served under me in India (or in England), I have said to him : "It is your business to know as much about the life of a soldier, and to know everything that he does from morning until night, and, mark you, all through the night, as though you wore the same uniform as himself." It is absolutely essential that we in the Medical Service should know this, because we are not solely the treaters of disease; we are essentially a preventive service of sanitary specialists, specially enlisted and specially paid as the preventers, as well as curers, of disease; and it is no more possible for us to act as preventers of disease without knowing the whole life of the soldier than it would be for a great physician like Sir Andrew Clark, or any other great physician in London, to treat you individually when you are ill without inquiring into every detail of your life and knowing exactly what the causes were which operated upon your health. This medical officer, then, whom the Medical Service details to look after each regiment or group of batteries, should, in the first place, know the whole environments of the soldier and his daily life. He should fully understand the hour he rises at, the hour of his morning's stables, the hour of his breakfast, the class of breakfast he gets, the various duties he does during the day at his stables and drill; the hour of his dinner, the quality and quantity of his dinner, his work after dinner in the stables or at drill; the character of his tea, and in the evening how he finds recreation when his work is done. He should know every hole and corner of the barrack he lives in; and all through the night how that barrack is ventilated and its sanitary condition cared for; he should know exactly how the soldier is clothed, and what the rations are that he gets during the day. Those things can be taught to any young officer, and officers who have not seen the weekly diaries of sanitary medical officers would be surprised, I think, to read them over. I can produce here the diary of medical officers doing sanitary work in this garrison, and I should doubt if there is a single detail of the soldier's life from morning till night, and night again till morning,

that we are not trying to study and to master, because we have only one thought, namely, how best to work with you and in every way to combine with you, so that England, who looks to us both to care for her soldiers, may be made stronger by our conjoint action for the day of danger.

I say, then, that those medical officers who are detailed for the sanitary care of regiments or batteries are doing those sanitary inspections frequently during the week. Thus on one day of the week they would go and inspect the barrack buildings and see them thoroughly, and I always find in any garrisons where I have been in charge as medical officer that it is not possible for any medical officer to do his sanitary duty properly by the regiment if he endeavours to carry out inspections of men and barracks on one day; because if he stops for a moment to look at anything that is defective in the sanitary state of the barracks he is sure to be keeping the men in a distant part of the barracks waiting for him and keeping them away from some important duty. I repeat from long experience that it is not possible for any medical officer to make those inspections of men and barracks at the same time and on a single day.

The officer then inspects the barracks and he inspects the men. Now, many of the younger medical officers have complained, and are complaining, about the difficulty that they experience in carrying out these inspections. The other day I saw a letter in a military paper from a medical officer proposing that all these inspections should be abolished, that it was impossible to carry them out, and that they were a perfect farce. On the very day that that letter appeared in the paper, on the parade of this very garrison, one man was sent off parade sick with scarlet fever, out of the West Rear Range: another man was sent off sick with a disease like scarlet fever; and I myself on another inspection sent a man to hospital with jaundice. Now, why are the medical officers wishing to get rid of those inspections, for they are really a most important matter? It is because it is difficult for them to get proper parades of the men. They go into the barracks and they find it difficult to know to whom they should look; a parade is formed up for them in a scratch way, and is often a feeble and farcical affair. I am not speaking of Woolwich particularly, but over and over again I have had to write to Commanding Officers and point out that while the number of men in a corps or garrison is strong, the number on parades given to us are very weak. In the same way in going about on the sanitary inspection of the

barracks, one does not know to whom to look to go round with one. I say to a medical officer, "You are posted to the sanitary care of such a regiment. I beg you to go down and leave your card at the orderly-room. I specially want you to know the Commanding Officer socially and personally," because unless you are able to approach him socially and personally you know when letter writing begins efficiency constantly ends, and it is essentially necessary that there should be the most free and complete intercourse between the two. But if we find this great difficulty exists in the first instance in getting our sanitary officers themselves taken round the barracks by someone who is responsible and who knows the barracks, and, secondly, in getting a good health inspection parade of men, the whole thing degenerates into a farce, and every soldier undervalues it. "Let us, I say, most earnestly come to some definite conclusion one way or the other on this sanitary routine; either let us do the thing well or let it be abolished." because to-day, in the year 1894, the question of half-and-half measures and compromise is coming to an end in everything, and we in the Medical Service want to know how our duties stand, and what they are, and we desire to do them if we are really responsible. In a certain station abroad that I have got in my eye, I went to the Commanding Officer of a regiment in the garrison and I said to him, as the senior medical officer of the station, "It is my interest and yours that we should both work together. I will give you an officer who will make your regimental inspections, but I beg you to give him a responsible officer to go round with him." I said then, and I say still, that I do not consider that the officers who fill the post of quartermasters are the proper people for this work; they do their work in the best possible way, and we could not get on without them; but I maintain that it is essential in the sanitary care as is the governing of a regiment, that an executive officer, the representative of the Commanding Officer, should meet my officer, and that the inspection should be made conjointly, so that the reports that are made shall reach myself and the Commanding Officer straight and direct. The quartermaster represents not the executive side, but an important administrative side if you please; but the command of English soldiers, which, mind you, implies much power in our Army, also implies great and most serious responsibilities; and, therefore, throughout my service at home or in India I have endeavoured in the regiments I was mixed up with as Senior Medical Officer to get a subaltern officer as well as the quartermaster

to go round with my medical officer at these inspections. The result has been in every way excellent. You can get the work done well, and it is astonishing what a different thing sanitation becomes under such a condition. The sanitary inspecting officers then, of the various batteries or regiments, make out their weekly reports of the sanitary inspections made on the Friday and Saturday, and, on the Monday morning, I myself had when in India, and have every week here, a regular sanitary conference with the sanitary officers serving under my orders; that is to say, I meet all the medical officers of those regiments, and there is no sanitary question or shortcoming so far as my lights go (and I have had twenty-nine years of a soldier's life) that is not fully and freely discussed, and I read over the diaries. If anything has gone wrong I say, "Have you written about this to the Commanding Officer?" The medical officer replies, "Yes, I have." "Then bring me the reply; what is it?" And I would say to officers commanding the various units that when sanitary medical officers write letters to them, of course they look for an answer; but very constantly we wait and no answer comes. I have found the matter so difficult to deal with in some most sickly stations that I have been at, that I went to the trouble of getting a form printed, saying at the bottom, "Will you please favour me with an account of what you propose doing in this matter so that I may fill up my own sanitary reports?" I think such a sanitary report form much needed in our Army.

Having read the letters and the diary, I advise with the officers as to the course to be pursued. Should the Commanding Officer write back, and say, "I regret to say I am unable to carry out your suggestion on account of so-and-so"; then the matter, so far as it lies between those junior sanitary officers and the Commanding Officer, ceases; it passes to me then, and I myself write to the Commanding Officer of the regiment, pointing out the necessity of such-and-such a suggestion; and when he replies, if it is a senior officer writing to me, probably he may modify his opinion and the thing may be done, or he may reply, "I regret I cannot see my way to carry out the suggestion." Then the matter ceases between him and myself. I then write a letter to the Principal Medical Officer, pointing out that I have addressed Colonel so-and-so as to the fact of his taking out the men at such-and-such an hour in the morning and keeping them out for such-and-such a time, and then the men coming in swarms to me sick in the evening because they have had no food or no proper food, and that it causes me great trouble; that I have requested him to

consider the matter and asked him if he could modify it, but that he says it is not possible; and then I beg the Principal Medical Officer to consider the matter, and if he concurs with my views I beg him to move the General Officer Commanding whether he can order the Commanding Officer to do so-and-so. Then the matter passes out of my hands and lies between the District Principal Medical Officer and the General Officer, and they discuss the matter. The General Officer may concur and order the suggestion to be carried out, or may not concur and the whole matter falls for a time into abeyance. These recommendations may refer to any possible matter in the wide range of sanitary duties.

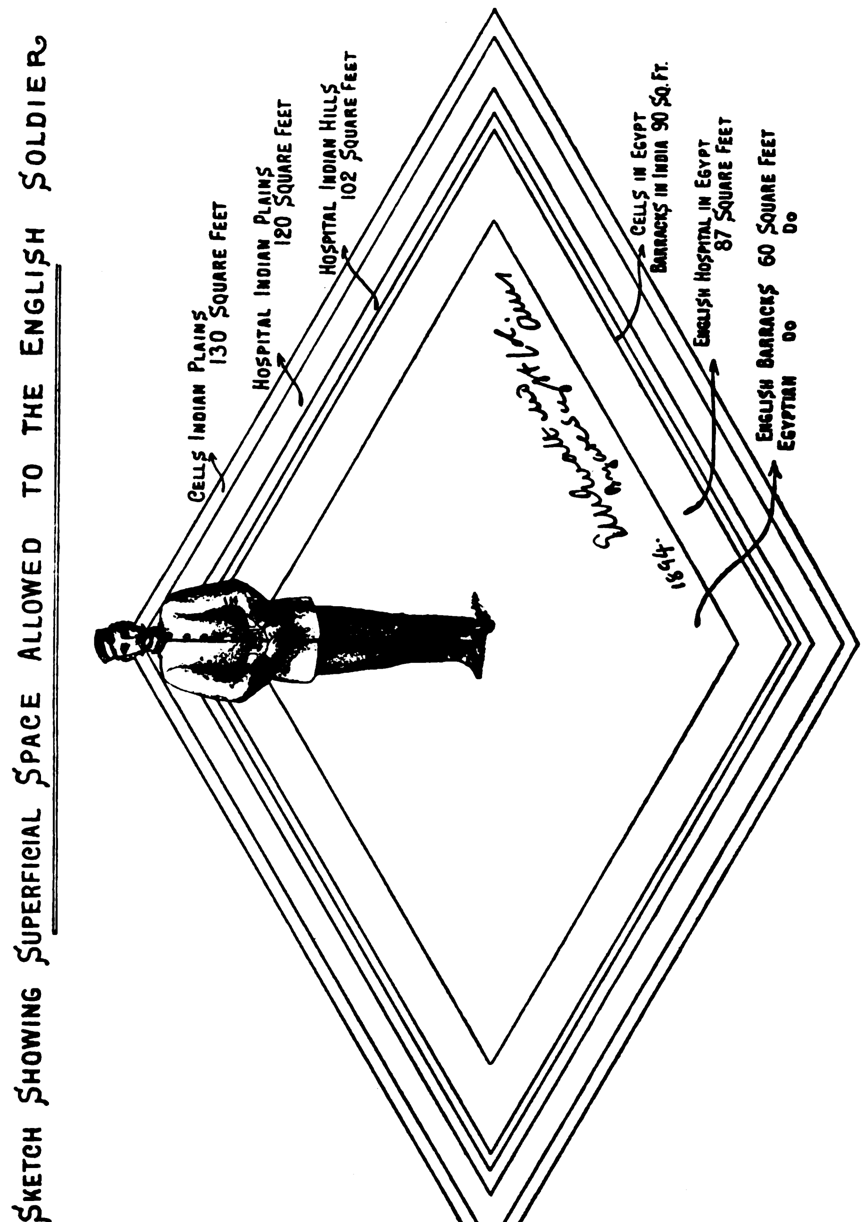
From the various weekly returns compiled by the Sanitary Medical Officers and myself, the Sanitary Officer of the garrison makes out every quarter a quarterly sanitary return dealing with every possible sanitary and health question; referring to the healthiness of the barrack-room, the overcrowding, the water supply, the latrine arrangements, the clothing, the drills, the cooking, the food, and everything. And this report, together with the remarks of the Principal Medical Officer of the district, go in one report up to London to the Director-General of the Medical Department, and the latter then, as head of the Medical Service, considers the reports with his sanitary staff in London, and advises the Commander-in-Chief as to what he considers should be done. At the end of each year a Blue Book is published, dealing with the health and sanitary conditions of the Army, and this is sent to the War Minister, and by him printed and presented to the Houses of Parliament. It embodies the statistics of the sickness of the Army and the sanitary reports of the Principal Medical Officers of Districts; but I do not see in this Blue Book the final opinions of the Director-General of the Army Medical Department on the health of the Army as a whole. The Blue Book contains the reports of the Principal Medical Officers of the districts throughout the Empire, which the Director-General simply embodies and forwards on to the War Minister, and that official to Parliament. I think myself that it would be a great thing if it were possible that the Director-General in London, who has the enormous benefit of receiving the reports of the Principal Medical Officers all over the world, should give a summing-up on the various sanitary matters that are put before him for the information of Parliament. This is an outline, I say, of how the sanitary side of the Army works as regards its organization from

the sanitary officer of a battery up to the Director-General and the War Minister.

I would now come back from these general remarks to the absolute details of sanitary matters. Let us begin with the barrack accommodation of the soldier. I told you that in 1858, after the breakdown in the Crimean War of 1854-55, a great Commission sat, called the Sanitary Commission, and made certain recommendations. They made a recommendation that every soldier in barracks should be allowed 600 cubic ft. of air space. They found when they examined the barracks at Chatham that the proportion allowed to each man was only 300 cubic ft., and they made the recommendation that each soldier in barracks should receive 600 cubic ft., and that ventilators should be placed in the room which would allow the air in that 600 cubic ft. of space to be changed twice in one hour, so that a soldier might be able to receive 1,200 cubic ft. of breathing air in the course of one hour. Now, why was this asked for? Was it by a fluke or chance? I say that I can no more modify my opinion as regards the cubic space for the soldier than any gunner here can modify his opinion as to the thickness of the parapet as regards the penetration of his shot. It is governed by a law. A human being to breathe healthily and well requires 3,600 cubic ft. of air in the course of an hour, and the total "ration of air" that the soldier now receives from the country is only 1,200 cubic feet per hour, that is to say, far and away below the normal average of a healthy man. The result of the old overcrowding of barracks was always that it resulted in consumption, phthisis. This consumption, this destructive lung disease, was caused by the overcrowded men breathing in and out this poisoned air into the room and poisoning the air with carbonic acid gas; and, furthermore, and much worse, by pouring out of their lungs in the course of every day 30 gr. of organic matter, which is the waste material of the body. This poisonous atmosphere, which, mind, will poison an open wound if exposed to its pernicious influence, will cause a strong, healthy man to sink into ill-health and give him consumption, and did in the old days kill off the splendid ante-Crimean guardsmen at the rate of 20 per 1,000 per annum. Put yourself, then, in our position as medical officers, who all of us know this, and who are taught at Netley the danger of this poisoned air, and say how can I be silent, or how can my officers be silent, or how can you expect me to be silent and not write and point it out when anything like overcrowding occurs? I say that if I was to be negligent or silent

I would be as much a traitor to the efficiency of the Army as that officer in command of an outpost who sees the enemy approaching and is such a poltroon and such a traitor as not to report it. To us in the Medical Service, who see the evil results of over-crowding, there is an enormous force driving us onward in the sanitary struggle for the soldier. It is not that we may be more humane or more philanthropic than other officers, but if I stand in a garrison every morning and see the whole sick of that garrison pass through my hands and hear from every individual private soldier the reason why he is sick, and why he has fallen ill, and if I hear from every soldier's wife the reason why she is ill, or her child is ill, I say that the force acting upon me is an enormous and irresistible force. This is the force, then, which is driving us to write and work and, perhaps, bother you in the middle of your work for the soldier's sake. An officer, who may be a keen gunner, and who believes absolutely in his guns and horses, may, by reason of his very keenness, forget for a time that behind the gun is the man who works the gun, and riding the horse is the man who is ten thousand times more valuable than the horse. The man is our care, and we, hearing his story and seeing his condition, are perpetually urged forward on the pathway of sanitary progress for his sake. We are urged forward, then, not only by the actual breakdown of the soldier's health, which we see for ourselves, and by the reports of the soldiers who are actually our patients who tell us the reasons of their illness, but constantly the Medical Service is being made use of by officers of rank and standing to urge forward improvements or recommendations, which they themselves hesitate to put before the authorities. How often have I said to such an officer, "You are using me to put this matter forward; why not represent it yourself? You have rank, standing, and position; why come to me?" He will reply, "The Medical Service is independent, able to speak, and unless you assist we cannot succeed." I maintain, then, that general or even higher officers in high command, when they receive recommendations or suggestions from the Medical Department, may be, and often are, entirely unaware of the real sources of the recommendation.

The more hard or unyielding the general, the more is the Medical Service used to move him. How clear, how definite, how unassailable, should be the rank and status of the sanitary officer liable to the pressure of the upper and the nether millstone in the clear discharge of his duties to the Army. Surely he forms a definite part of the Army that cannot with any sense of justice be


Sketch Showing Superficial Space Allowed to the English Soldier
Cells Indian Plains 130 Square Feet
Hospital Indian Plains 120 Square Feet
Hospital Indian Hills 102 Square Feet
Cells in Egypt
Barracks in India 90 Sq. Ft.
English Hospital in Egypt 87 Square Feet
English Barracks 60 Square Feet
Egyptian Do Do
1894

put aside. We in the Medical Service knowing this responsibility, knowing these heavy duties, knowing the various unseen currents acting upon us, and placing us in direct prominence as sanitary officials speaking for the good of the Army as a whole, can never cease to claim defined and unassailable military status, not merely for our own personal sake, but for that Army who in every rank, from the highest to the lowest, are at times compelled to have recourse to our assistance.

The Army does not want a body of weak-kneed, trembling medical officers with defective status and shaky rank, but rather a highly-trained and thoroughly disciplined and independent body of sanitary advisers in deep sympathy with the Army as a whole, and bringing all the help of modern scientific investigation to bear on the preservation of the health efficiency of that Army which, scattered over an enormous Empire, is fighting a trying battle with disease and death in peace and in war wherever the English flag is flying.

Let us return now to purely sanitary details. The Sanitary Commission in 1858 fixed on 600 cubic feet of air space for the soldier, and they put in ventilators which enable this air to be changed twice within one hour. There is a law governing the size of the openings of the inlet and outlet ventilators which enable a certain fixed amount of air to come into the barrack-room, and these give the soldier his definite "ration of air." The air of the average badly-ventilated barrack-room about 3 o'clock in the morning can become almost poisonous, and a horrible odour of organic matter from the soldier's body and bad air from his lungs can and often does produce a thoroughly deleterious atmosphere. It is as necessary to have a good system of ventilation in a barrack-room so that the air may be changed, as it is necessary to have the barrack latrine outside flushed by water. This flushing with fresh air, called ventilation, is wanted to sweep away the poisonous organic matter so as to make the room sweet and fit for the soldier to live in. For whose sake? For all your sakes. And why? If the soldier sleeps for eight or nine hours in that bad atmosphere, when he rises in the morning he is in a semi-poisoned state, he does not feel fresh and fit for work; and what is the result? He looks about for drink as a stimulus. The soldier after a long night in that bad atmosphere, stupefied by bad gases, may also be below par in a nerve sense and be in a bad temper—that is to say, he is not fit and well as he should be. The difference of good and bad air in its action on ourselves is very well shown by

the depressed state in which we feel ourselves on an Indian troopship when coming up on deck in the morning from the stuffy cabin below stairs where we may have passed the night, and the feeling of freshness and elasticity we feel after sleeping in some well-ventilated Indian tent; in the one case we are in good temper and fit and fresh for work; in the other case we are below par and unfit for work. Why? Because in the troopship we are semi-poisoned by the poisonous gases and organic matter given off by the hundreds of people in the crowded 'tween decks below and which drifts back into the officers' cabin and into pandemonium. The soldier, then, has a fixed and definite ration of air allowed him by the State. Just as he is allowed a "ration" of money called pay, and a "ration" of food, and a "ration" of clothing, and a ration of water in the tropics to sustain his existence, so he is allowed by the Regulations a "ration of air," and there is no more legal right to take away from him that defined ration of air by over-crowding him than there is to take away from him his pay, his food, or his clothing allowance. We must never forget also that the ration of air of the soldier is in no sense a full ration. If I were to sit down in a physiological laboratory and deal with a ration of air in a purely scientific and abstract manner I would then say that on purely physiological grounds he requires 3,600 cubic ft. of air per hour to keep him healthy and fit. The Sanitary Regulations, which were framed in 1860 and which still govern the Army, were only tentative, and as the official wording goes, "Only for the present time (1860)," only give the soldier 1,200 cubic ft. of air per hour; therefore he is to the bad the difference between 1,200 cubic ft. and 3,600 cubic ft. per hour. In those bygone days, so wrongly called the good old days, the terribly over-crowded state of the men caused the dreadful atmosphere of the barracks, bringing about air poisoning and ending in consumption. While the deaths in the civil population of the military age (20 to 40) were 10 per 1,000, in the splendid cavalry of the Line they were 18 per 1,000; in the regiments of Foot Guards they were 20 per 1,000, and in the infantry of the Line 15 per 1,000, as against 10 per 1,000 of the same ages in the civil populations. That is to say, this elaborately turned-out, heavily pipeclayed, and absurdly dressed soldier of the old pre-Crimean day was dying of practically preventable destructive lung disease, and the Army Medical Service up to 1858 had no power to say one word of advice or warning in this most serious death-rate. In those bad old times it was an often-quoted saying of old-school generals that the opinion of the military

doctor was valuable when it was asked for, that is to say, no sanitary initiative existed for the doctors. Since 1857, however, this power of sanitary suggestion has existed, and with thoroughly sound results. In studying the above death-rates of the Army we should note that consumption caused 67 per cent. of all the deaths in the Household Cavalry during the pre-Crimean period; 50 per cent. of the deaths in the cavalry of the line, and 57 per cent. of the deaths in the infantry were from consumption, a probably preventable disease caused or greatly developed by overcrowding in the barracks. At the present time the death-rate of the Guards has fallen from the 20 per 1,000 per annum, that bad standard of old years, until, in 1890, it had fallen to 9·88 per 1,000, and you will find in the A.M.D. Blue Book that in the year 1891 the report shows that the death-rate of the Army has fallen to 9·13 per 1,000. What is the cause of that? It is, I think, largely caused by the better space and the better sanitary conditions and environments that the soldier is living in, and these results have been largely owing to the sanitary advice of the Medical Service acting in preventive capacity as the preventers and not merely the curers of disease. It is in the discharge of this duty that the greatest moral courage and independence of character is needed. There is nothing more easy and charming than to go to a great hospital and to work there; no one interferes with you, and you may make yourself a great name. I may serve in a far-away garrison in India and may make a great name by treating the 50 or 60 cases of typhoid that occur in the year, and may be much thought of and honoured. There is a better way to make a great name. I say that if my child is ill and there is a doctor close by who can cure him of diphtheria he is a good man; but the doctor who prevents the attack occurring is a better man. That military doctor who, knowing the soldier's sanitary wants, his water supply, his clothing, and his food, and his surroundings, and who seeks the reasons why a man is getting sick with typhoid, is a more useful man to the nation and the Army, and a better man than the other, however good he may be. You want in the Army as a medical officer the man who will give you in the battle 10 more men to your battery or 100 more men to your regiment. Is that the case or is it not? It is most certainly. I say that the sanitary side of life is of great importance. You may read in the military papers letters which say that the military doctors should be what they call a doctor; they think and talk as if in England there were not more than 1,000 doctors who do no curative doctoring whatever in the way of prescribing for the sick.

But the 1,000 doctors in the public health service of England are most masterful men, and have far greater authority as regards the inspection of food supply and the sanitary condition of the people than we have in the Army. These physicians are just as much doctors as the others, but they are dealing with a different side of the question of life and its ailments, viz., with the question of prevention of disease; and for you in the Army it is of great importance that you should not get in the military service weak-kneed and craven men afraid to speak on sanitary matters, but men of rank and standing who would be able and willing to speak out and point out the path to sanitary improvements.

The Army death-rate has thus fallen largely by going into sanitary matters, and you have benefited by it, by having men in your ranks of the Army healthier and readier to go to war. Short service, no doubt, has also to be considered as a factor in this matter. While the death-rate has fallen and invalidism has fallen, it must be remembered that the soldier to-day stops with us but a short time, and the health returns may, perhaps, be vitiated somewhat on that account. I came home last year from India in a crowded Indian troopship, and I saw that point very marked. Many of the men there were not invalids officially (nor did they appear in any invaliding return), but they were no more fit to go into the English labour market and compete with healthy English labourers than any of us coming home seedy with ague would have been. Their unfitness was entirely owing to the Indian climate, although it figured in no return. They had not, however, re-engaged. Many said to me, "It is too much bother to re-engage; I am constantly getting ague and feeling seedy, and I am going to the reserve." In the old days when I joined we kept those men and they could not get away, in fact there was no chance of getting away except invaliding, whereas now men simply do not re-engage.

This question of bad air and overcrowding of barracks is of the greatest importance for this reason. Impure air goes directly into the lungs, but bad water may be killed in the stomach; I may drink bad water and the juices in my stomach may kill the bad water, and I may survive. It is well known that 2,000 persons in a large church or building will in two hours give off 17 gallons of water, and as much carbon as would come from 1 cwt. of coal. That is not a very pleasant atmosphere if it is not constantly changed. Do not forget also that 30 gr. of organic matter are given off per man per day from his body in the shape of worn-out skin and *débris* of the body. The smell of the men in barrack-

rooms may be very unpleasant and most trying, altogether caused by the closeness of the men and the want of fresh air. And that affects the men's health and discipline. You must remember that the barrack-room is not only a dormitory; the men are eating and drinking and sleeping in it, brushing their dirty boots in it, brushing their dirty clothes in it, pipeclaying their belts in it, and smoking in it, too, and the air can become very vitiated from all that. In dealing with the question of overcrowding, then, we have got to bear this in mind, that we are dealing with a fixed law which we should recognize very fully as to the danger of interfering with the cubic space allowed to the soldier, and I trust that whenever letters come to you on this matter you will receive with great consideration any suggestions with regard to any question of overcrowding.

It is very needful we should speak here about the question of urinals. There is still in all the barracks in England, or in most of them, this horrible urine tub—that is to say, you have a horrible looking thing, a wooden tub; of all things most highly absorbent, which is supposed to be tarred every quarter, and into this the men urinate. I must tell you that no light is allowed at night by the Regulations for this tub; the soldier comes out of the barrack-room on to the lobby, there is no light, and the consequence is (and we may see it in most barracks) that the ground round the urine tub is constantly saturated with urine. And a case has occurred, I think, even in this garrison where the urine has gone not only on to the floor, but through the floor, and has come out on the roof of the room below. A case occurred before my eyes where a soldier on the inner side of the room was sleeping with the head of his bed against the wall where the urine tub was and the urine soaked through, and he complained, and I think justly, of that urine oozing out towards where his bed was. Those questions are very important. We want, in the first place, light at night over the urinals, and we want regular urinals built as you can see them at railway stations, and attached to the buildings with water flushing them and light over them, where the soldier can urinate without soiling the floor and tainting the air of the barrack passages. Why should railway stations and other places beat us in civilization? I think we can get these urinals if we jointly push the matter, and we mean to do it; we will push away at this urine tub and get something better for the soldier. Even an iron bucket would be better than an absorbent wooden tub.

My next point is about bath-rooms and lavatories. I could not

exaggerate to you the defective condition as regards cleanliness of the person of our soldiers. No one sees as we in the Medical Service do the absolute filth of the soldier's person. A man comes up before me well dressed and well turned out, but he is a whited sepulchre; the condition of his person and the odour that comes from him are very unpleasant. What is the reason? The reason is that the Regulations only allow 1 per cent of baths for the troops, that is to say, that for every 100 soldiers only one bath is allowed; and they allow twelve basins per 100 soldiers and four footbaths. But you must remember that the soldier is not allowed any warm water to wash with. I cannot tell you what an important matter this is. This odour, this *esprit de corps* in the very worst sense, which comes from the body of the soldier is most offensive. If anyone will come over to the Auxiliary Hospital in the morning he will have a smell like the odour of a troopship in the Red Sea. Now, all that arises from preventable causes. We want warm water laid on most awfully. I maintain that from October 15 to April 15 all bathing ceases in some garrisons, and the body of the soldier is not washed at all. That comes before us doctors in the most striking way. I have to examine the man's chest and the odour is most trying. Remember the cubic space is based on the clean man; but you have this man going to bed in the barrack-room with his body not washed, so that the air becomes offensive and tainted, and this affects the health, the fitness, and, in the end, the discipline of the soldier. As you know, in this garrison here during the past few months a great improvement has been made; that is to say, that by the efforts of Colonel Spragge warm water arrangements have been placed in five groups of barracks, and I had an opportunity the other day of totalling up the number of baths taken. I beg of you not to say that soldiers will not do certain things, for I find that between the end of November and January 13 in this garrison 1,200 warm baths were taken in one of the five groups of barracks alone in the baths quite lately put up. And those baths, mind you, are worth in the town 6d. each. What is going on round the barracks here? Every possible religious denomination is going in for baths for the soldiers; you can get a Church of England bath, or a Wesleyan bath, or a Unitarian bath; you can get all kinds of religious baths, but no State bath. But the State is bound to wash the soldier. A devoted lady, devoting all her time to the soldier, said to me the other day, "We do so much want a bath!" She suffered very much from the odour of the soldiers in going amongst them. Now,

we must do away with all this bathless condition. My own view is that we cannot provide little trumpery bath-rooms in very small groups of barrack-rooms, but just as the Municipality are building public baths there should be in every large barracks a separate bathing-house, in which men could have plunge baths and wash and bathe themselves thoroughly. I would ask any gentleman going round the town here to go to the public bath buildings opposite the Town Hall, and I maintain (I do not care what his views are about baths) that he will be surprised at the municipal baths of Woolwich, they are splendid; the Municipality of Woolwich are laying out £40,000 to wash the Woolwich people, and you would be surprised—I maintain whatever your dreams are they will be exceeded. There are two magnificent plunge baths into which you might put, I will not say an ironclad, but a very large vessel, and there are exceedingly good first- and second-class baths, which provide everything that is wanted. If a soldier is in the Army, where he cannot express an opinion and has no vote, it is necessary for his officers to put forward this matter thoroughly for him, and to say that it is affecting the recruiting of the Army; that better men will not come to us because of these things. If a man outside in civil life can go to the municipal baths, he will look upon the Army when he comes to it as below a healthy standard. You must advance as the civil population are advancing. Look at Plumstead. You see house after house by hundreds built for workmen, who a generation ago were living in single rooms, as eighty families of our own live in Woolwich. We have, to-day, eighty families living in eighty rooms, each family having but a single room. Then, I say, the baths have been thoroughly appreciated, and the result of our inspections on the Saturday is very marked. In one unit particularly I was charmed with the cleanliness of the men. I think I told an officer here about it, that their feet were so clean that they could have been used as ornaments for a lady's table. You come and say to me, "Oh, but they will not care for them; they will not use them." *But they will do much if only we teach them to do it.*

I would say a word here on married quarters. I have said already that we have eighty families here living in eighty rooms, each family having but a single room. The new Regulations from the Quartermaster-General's Department, about married quarters, seem very reasonable and very just. Quite recently I had the pleasure of going round the newly-built married quarters, and there is in them a great improvement in space and comfort. I think

they quite satisfy the dreams of the most idealistic man. The whole system of married quarters is an evolution. Formerly the wife was not recognized at all ; then she crept into the barrack-room and slept there, with a sheet or blanket put across to screen her from the soldiers. This was in the good old days, which were really the bad old days. Then she moved out of that, and then they gave up the barrack-room to four or five families ; that existed in my day, in Chatham, in 1865. Then they went from that into a single room built as married quarters. Next year, when they will go into the New Brookhill Quarters, I think the demands of the most exacting sanitarian will have been met for the time being.

We have spoken about the percentage of baths, one bath being allowed per 100, and four footbaths per 100; but the soldier has also the right to go to the latrine. But it may be full at times, and I have seen great trouble in that matter. What accommodation do the regulations give to the soldier in that respect? They allow five latrine seats and five urinal spaces per 100 men! The question came before me the other day, and how did I find it out? I searched book after book, and suddenly by good luck I came across a most valuable book. I will tell you the name of it; it is called "The Synopsis of Barracks and Hospitals," and it is kept up in the Commanding Royal Engineer's Office. I maintain that there is no book that I know of that ought to be more in the hands of Commanding Officers. I have not got one; the Principal Medical Officer has not got one; not a single officer has got one, and I do not know who has except this one copy in the Commanding Royal Engineer's Office. This gives us all details about the baths and latrines; it is not in any of the Regulations. We have volumes of military books, but this very vital book is not there at all. I would say that the Government or the Military Authorities would do well by publishing this book; it is not anything confidential, it is the number of baths and basins, of latrine seats, and the amount of cubic space, and many useful things about hospitals. I was thinking about blinds for my hospital and how I could approach the Commanding Royal Engineer, when I found in this book that blinds for hospitals are allowed, and at once I applied for them. But we do not want to be fighting these kinds of questions all over the Empire ; we ought to have this book given us. I applied officially, through my superiors, to get a copy, and the reply was that this book is only supplied to the Commanding Royal Engineer. It is the family secrets, as it were, of

the Royal Engineer Corps. Why, I do not know, as it is needed by the whole Army. I hope it will be made an official book.

The question, then, of latrine accommodation is important in this way: the last year in India (and when I think of the charming young officers who have died in India it is most sad) we had 1,380 cases of typhoid amongst the young soldiers in India, and we lost by death 380 of the Indian garrison by typhoid alone. The question, therefore, of the removal of latrine matter is a most important question, and you must not look at these questions as beneath notice. I cannot tell you how painful it is sometimes to go round on a barrack inspection. You come round by the Principal Medical Officer's direction. The medical officer goes to inspect the barracks, and who goes round with him? I have myself gone round with the quartermaster, and have been met by a casual subaltern, who looks upon the whole thing as a very great bore perhaps, and when you go to the latrine this subaltern stands aside and the quartermaster and the doctor walk in. Believe me, gentlemen, that "command" includes the latrine also. If you look the matter in the face there are lots of men in the barracks standing looking on, and if they see the officers stand aside they say it is not of the least importance. Now, I maintain that it is of great importance. Here, again, I say there are two armies: there is the army of the "Queen's Regulations," which is kept tight and hard by the Regulations, and there is the rational common-sense army. In the army of the "Queen's Regulations" a captain or a subaltern takes the Principal Medical Officer round; but there is another common-sense army, in which the Commanding Officer himself goes round with the Principal Medical Officer. Believe me, that the Commanding Officer, just like the Irish landlord, has his duties as well as his rights. You must remember that your command is supreme, and when the Commanding Officer goes round with the Principal Medical Officer the result is enormously good. The subaltern does not know much about these things, but the Commanding Officer is responsible to the Army and to England for all these things. I maintain that it is absolutely essential; it is not a question of rank, but is of great importance to the soldiers.

I would like to say a word here on the question of the soldier's bedding. The soldier is allowed 24 lb. of straw per quarter, and with this he makes the bed and bolster; no pillow is allowed him. I have brought with me here to-night the two sheets which are used in the Army; I think it will be instructive for you to see them. One is the hospital sheet which is used by the soldier in hospital,

and the other, which anyone might imagine was a piece of navy canvas, is the soldier's barrack sheet; it is a piece of canvas which has come here by mistake, and is called a barrack sheet. We are now pursuing the reasons why the barrack-room smells. The soldier does not wash; the men are lying there close together; the ventilation may be interfered with. But we now come to the bedding. The bedding is of straw and he gets two sheets. How often are they changed? They are only changed once a month, and the condition of those sheets, when they are used, becomes something very marked indeed. A soldier, mind, who does not wash, and whose body is not always clean, is lying for one month between those two pieces of canvas, and the result is very trying. I maintain that we might go to the country with a cry of a fortnightly washing for the sheets; and it would be a great comfort to the men. But you must also remember that if you give this coarse kind of sheet to the soldier he will not use it at all, and I find that only about one-fourth of the men use their sheets; the rest of the men turn in in their flannel shirts. And in the Artillery where they have got drawers they turn in as they come out of stables. A man goes to the stables, where he works all day and sweats hard (because your drivers work very hard indeed); he comes out with his drawers and shirt soaking in sweat and turns in and lies in this sweating condition in the blankets, and the blankets are washed only once a year and the sheets once a month. This man comes before me the next morning at the Auxiliary Hospital; I strip him, and he comes out of his flannel shirt that he has been sweating in for a week, and he puts off from his clothes a small portion of horse manure that comes out from between his waistcoat and his flannel shirt—that is to say, the man has turned in and has not changed his clothes in any way. And we want to look into those questions.

What, then, is done with the sheets? They are used sometimes to put over the saddlery; constantly to tie round his waist to keep him from soiling himself when he is doing up his accoutrements; they are constantly put under the pillows and beds simply for safety and not used at all. The soldier says, "Why, sir, use the sheets? I would as soon use a piece of coir matting." They also complain that the sheet is so rough that it wears out the flannel shirt which as soldiers they wear. A specialist in sheets told told me he thought the soldier's sheets would make excellent bath towels.

Then a soldier marries, and among other boons that he gets is

the right to use the hospital sheet; every married soldier gets a pair of hospital sheets once a month. I asked a married woman how often they were washed, and she said, "Once a week." The police have their sheets washed once a week, and so do the paupers in the workhouses, but the soldier's sheet is only washed once a month. In Egypt they are washed once a fortnight. In India the soldier gets two sheets given to him when he arrives out, and one sheet a year afterwards, and as there he is allowed to wash them at his own expense he washes them once a week. Then, as regards the straw pillow, or bolster rather, I find that the old soldier, the man who really likes comfort, always travels about with his own private pillow. And the married people never think of using the barrack beds; they have their own private mattresses, and they use the straw below them to make them softer. But I find that in some garrisons, such as Aldershot and Portsmouth, they have issued a better bed, a coir bed, which makes a capital bed; it is used in India. The Government allows there a coir bed and it makes up a very good bed, and the men tease the beds themselves and wash the mattress case. There are 2,000 of them now lying down in the Dockyard, and I was told that there were several hundred in use in London, and also at Aldershot and Portsmouth. They are distinctly an advantage. Therefore I think the straw bed might be replaced by the coir bed in Woolwich. Why should the soldier lie in a straw bed? We have long since chucked away the straw bed for sick men. Florence Nightingale said if you want to kill a man who is seriously ill put him on a straw bed, because it takes out much of the vitality from a man. The soldier's bedstead is 27 in. wide—his mattress is too narrow and his sheet is only 50 in. across—while the hospital sheet is 72 in. We want a lighter bed with wire-woven mattress wider than the present. We want hospital pattern sheets, and blankets scoured at least once every six months; but the sheets must be washed every week.

I have put down here under the head of bedding the guard-bed. A more brutal, useless and thoroughly unfit construction does not exist in the Army. It is not of the least use to train a man for war. I have been in five campaigns myself, and everyone knows that no one is asked to lie on anything like the guard-bed. There is no reason whatever why the bedstead, with a mattress of hair, should not be found in the guard-room. If you speak to the soldier he will say, "Certainly, I would much sooner lie on the ground in the field than on the guard-bed in barracks." What is gained by this guard-bed? Remember that you do not harden your men. No

officer ever yet hardened his men. Why, the officers beat the men in everything, and we go out to war off very good beds. If we want to be hardened let us all go on the guard-beds together. If you give the soldier a proper bed for a guard-bed he will do his guard better; it is not the sentry-work alone that knocks him up, it is the guard-bed; they are terrible contrivances, the remains of the bad old system. We want now to give the soldier a bedstead with a mattress of coir or hair, so that in the intervals of his sentry-go he shall get some chance of sleep.

About the question of clothing. I will not now deal with the question of tunics and those things, but as regards the question of the flannel shirt. The old army wore always a calico shirt, but General Herbert, who was Quartermaster-General fifteen years ago, devised at Pimlico a grey flannel shirt which contained 47 per cent of wool; it is not a woollen shirt altogether, but it is a great improvement upon the old one. Now we find great difficulty in getting the men to wear them, there is a laxity about it in some way; there is a want of the old parade system. I remember years ago how the soldier tucked up his sleeve and showed his clean shirt at the wrist. While you are sending men up to the hospital with bronchitis you must remember that every man whom you send up throws more work upon the men behind. If you want to know why the men get bronchitis it is because they do not wear the flannel shirt. It is of importance that he should also have some under-vest and not go out in this poor thing he is now wearing. Then he wears this shirt night and day, and it is very dirty. There must be a reinvigoration of the check of the "No. 1," or whoever it is in the Artillery, or the colour-serjeant in the infantry, or the officer himself must do it. That is to say, in this short service unstable army, in this raft that sinks in mid-ocean under our feet, there is only one stable element—not the non-commissioned officers, not the men, but the officers. So far as I can see, as the old system gives way and the new system comes on, it is more and more essential for the officer to be able to answer for everything about his men. I think that, as in the mounted corps you give every man drawers, you should give a pair of drawers to every soldier in the Army; the men would be healthier and better, and there would not be so many coughs and colds. And I would myself like to give the men some suit to sleep in. I said to a man some time ago, "What do you sleep in; do you wear a night-shirt in barracks?" "Oh, sir, they would tear it off my back in the barrack-room if I wore it." But many of those men have been

accustomed to better things. You would be surprised when a man comes before you as a recruit looking grimy and dirty, and to find that, although uncared for, this man has been in his own home well cared for. I ask him, "Did you have sheets in your mother's house?" "Yes." Then I ask, "Did you have night-shirts?" and they always say they had. In the Army they are sleeping in their day shirts often for more than a week, and that produces the most frightfully sickening odour in the barrack-room. On the troopship and in India a sleeping suit would save much trouble. The moment I go back to India I will propose that every man should get a regulation sleeping suit. I am sure it would improve the men's health, certainly it would improve their cleanliness, and it would improve the air of the barrack-room. The whole argument about dress can be summed up in this way: Believe me you cannot make any man work in one dress, whether officer or man; that is to say, for example, that a man cannot go out shooting in the Highlands in a long-tailed evening coat. We want a working dress for the Army; we want something for the internal barrack life of the soldier, and we want a sleeping suit for him to wear at night in the barrack-room. I notice that in "Parkes' Hygiene" it says that the German Army are to be entirely clothed in Jaeger suits under their clothes in war—that is to say, that they find that it pays. Of course, the existence of Germany depends upon its soldiers, and she finds that it pays. Bronchitis and pneumonia in the Army running into phthisis causes a great loss of service to the Army, and a soldier going on guard not properly dressed gets knocked up, and a thing that often attacks him is pleurisy. I remember I was in a very exposed station in India where pleurisy was a very common thing, and I remember a special case of this. I was going round the hospital with a general officer, whom everybody in this room would know if I mentioned his name, and I said to him, "This is a case of pleurisy," and he said to me, "What is pleurisy?" I think it was a pity that he should have had to ask such a question. If a soldier were to leave his rifle out in the rain outside the guard-room and it were to get rusty in the lock you would punish him; but behind the rifle is a much more intricate and charming rifle, and that is the man who carries it. We would be better friends if you knew more about disease, and we would be more efficient if we knew something more about soldiering. I think it is essential that the officer who commands the soldier should know what disease is likely to attack him. I venture to say that there is not a good horse-master in this room who would not be ashamed if he did not

know the various ailments that might attack his horse. When I go round the stables and see the charming care that is taken of the horses—why, they are gentlemen, they are well-groomed, well-shod, well-fed, and well-housed. But your men also have got to be looked after. When I look at the hoofs of the horses they are in beautiful condition. When I go to the hospital ward and turn down the clothes of the men's beds their nails at times frighten me; they stand out like tiger's claws, they seem never to cut them. They do not know how to use those things that make for sanitation, and you have got to educate them. Uncut toe-nails and filthy feet mean foot-sore feet and that means inefficiency in war.

As regards the soldiers' food question the history of its evolution is extremely instructive. Up to 1854 the Government made no contracts for bread or meat; it was done in the regiments by the Commanding Officer, who was sole master. He was sole master of the clothing, and the men got so snipped that the word "off reckoning" survives; the "off reckoning" was the cuttings off the soldier's clothes. In the same way the food also was provided by the Commanding Officer in the different regiments. It was a bad system, and the Government put an end to it in 1856. The soldier drew his pay in full, and the Commanding Officer cut his ration money out of it until the Government took over the rationing and knocked 3½d. to 4½d. off for the cost of the ration. The soldier thus gets his ¾ lb. of meat, 1 lb. of bread, and his pay besides. The regimental rationing system broke down through regimental neglect. Of late years we have heard much about the improvement of the soldier's food, but I would say that the soldier has not gained very much from the State despite all this outcry. We are pursued by two things in the Army, the dripping-pan and the stock-pot, but the original ¾ lb. of meat is all we have as a basis to work upon. I would say that the question of the inspection of rations is most important. No one, I think, can see the Army Service Corps Officers without seeing the enormous deal they have gained by the instruction classes which were formerly held at Smithfield and are now going on at Edinburgh, but I think that that information should not be limited to a corps which does not serve in India, where 70,000 English soldiers are serving under trying circumstances; you cannot conceive how bad the Indian rations are, and we all want to get a certain proportion of this instruction. There should be in every regiment a certain number of officers trained in this ration passing, and the medical officer should certainly get an opportunity of going through the course, because the hospital rations

do not come before those highly-trained officers at all. By long service in India our eyes get trained down to the bad Indian ration, and when one comes home it is well to go up to Smithfield again to find out what the proper standard of the English ration is.

I would also like to say that the medical officer has continually before him the question as to his right on a Board. Owing to the quibble as to what his position is, many of them are afraid to say one word on the Boards. It is very trumpery. We send down four men to do what three might do, and the medical officer is afraid to say one word until he is asked. I have myself consulted officers and they have said that he should certainly have an initiative. Is he to remain silent and wait until the President of the Board asks him? I say he should be a member of the Board and point out freely and fully anything that goes wrong. Why should our little trumpery frictions affect the Army? I say a curse on both your houses. While we are struggling and fighting the soldier falls to the ground, but if we are to combine we can certainly do the work better, and we cannot do the thing without hearty cooperation.

As regards the question of the soldier's ration, if you would like to compare it with the officer's ration, come with me on board an Indian troopship and see the two divisions of the ship—half the ship full of officers and half of men. I rise and come out of my cabin, and I have at half-past 6 o'clock a very grateful cup of coffee and bread and butter; the soldier at the same time has his coffee and bread in the fore-compartment: so far we are both equal. At half-past 8 o'clock I come downstairs and have a capital troopship breakfast, a very good English breakfast; the soldier has his breakfast along with my early breakfast. At 12 o'clock he has his early dinner; I come down at 12 o'clock and have a quantity of cheese, sardines, and beer. At half-past 4 o'clock he has his afternoon tea or coffee, and I have mine in the saloon. But there the comparison between the soldier and myself ends entirely. When I went out to India I found that the last meal given to the soldier was at a quarter past 3 o'clock in the evening. I wrote to the officer in command of the ship, pointing out the long interval that he went with no food, till half-past 6 o'clock next morning; there were swarms of undergrown boys going out, and these boys were getting no food all that time. He said he was awfully sorry, but he could make no change; he would refer the matter home. But when I came home the other day the same thing was going on. And, remember, I was going down at 6 o'clock to a remarkably

fine dinner; dinner on a troopship is a great restorative after the fatigues of the day, but the soldier had no dinner at all, he was without it. And what would our lives be in India, or all over the world, if it was not for the messes, which have made our lives happy and pleasant? Let us remember, then, the soldier by comparison with the officer is short of one meal. On the troopship you can see it in a microcosm; I am getting a good dinner and he is not. And who are these men? There are swarms of young soldiers going out to fight against typhoid who want food awfully, and there are swarms of them coming home tired and worn out by the Indian climate to a warfare which is far more bitter than any Indian campaign, the warfare in East London, leaving them far more dangerous to the public. I see them here in Woolwich. The other day I saw a man who was knocked to pieces with ague. I said, "I remember your face well." "Yes, sir, I met you out in India; I am knocked to pieces by ague." And the Indian Government, which is using these men for seven years, sends them home, and they are turned adrift at home on the same pay that a man may get by serving his whole time at Woolwich. If India uses these men I say that these men on coming home should receive a surplus reserve pay for the first year to carry them over the bad year, when they are recouping from the wear and tear of Indian life. This question is of great importance—India exists by those men; the private soldier made India for us and he gets nothing at all out of it. We want to make him the same as the Indian officer who comes home on furlough. Let us give him a certain special retaining fee for the first year when he comes home, so that he may fight his battle—a terribly bitter battle—for work in England.

In the question of the soldier's food, we are pursued by the stock-pot and the dripping-pan. Now the stock-pot is not used in the great mass of garrisons, and it is not popular; the men have an idea that the stock-pot is recruited from the bones that every class of man has nibbled at the dinner table, which is not the case, of course. The removal of the bones by unhandy men knocks the meat very much about. As a result it is not much used. So far as the Government ration and the 3½d. or 4d. stopped for groceries go, the soldier is still, to my mind, underfed. When you compare the feeding of different foreign armies—we do not want to compare ourselves very much with foreign armies—but there is one army that I like to compare ourselves with, which is composed of men of our own race, that is the United States

American Army, which is largely composed of Irishmen and Englishmen. There the ration of the soldier is a very fine one. It is put down at $1\frac{1}{4}$ lb. of meat daily (against our 12 oz. he has got 20 oz.), and also 18 oz. of bread against our 16 oz.; he has also 1 lb. of potatoes, which our men do not get at all. We are trying to keep the soldier on a ration that he cannot do his work on. We give him his 1 lb. of bread and his $\frac{3}{4}$ lb. of meat and stop him $3\frac{1}{2}$d. or $4\frac{1}{2}$d. a day for the grocery ration, but it does not keep the man going, and the way to prove it is that in those corps that are better paid, like the Army Medical Service, the Royal Engineers, and the Army Service Corps, the men lay out much on food. Do you think it goes in drink? Not at all. A man drinks because he wants food. The measure of his shortness of food is the measure of his amount of drunkenness. And I find that in those corps the men are using their extra means largely to buy extra food. I maintain that if extra food were given it would largely diminish drunkenness. In a foreign garrison that I served in the drunkenness in certain corps was terrible; there was bad food, and, as a result, much drunkenness. Feed a man well and give him change of food and he will not drink so much; it would be a thoroughly good investment to feed the soldier well. A man wants at least his 1 lb. of meat a day. I have asked dozens and dozens of soldiers if the $\frac{3}{4}$ lb. meat ration is sufficient, and I find they are all laying out extra money; those other well-paid corps are all laying out more money to keep themselves strong and fit. What for? To keep themselves strong for England's sake. Look at those young recruits who are going out to India to fight typhoid; they want to be well fed most awfully. The whole subject of the fitness of the reserve soldier for hard work on leaving the Army depends on whether he has been well fed in the Army. If he is poorly fed he is not fit for the terrible struggle for work in civil life. I think no work can be heavier than that of a driver of artillery, and if you want to get good work out of him you must put good food into him; in every class that is wanted. I am distinctly of opinion that he would be a soberer and a better man if he had more food. The German war ration is very striking; it is put down in Parkes' book as 26 oz. of bread, 53 oz. of potatoes, 17 oz. of meat, and he also gets a ration of beer. This great fighting machine, the German soldier, fights because into his body you put plenty of food. And in every case it is the same thing. The English navvy is thoroughly well fed, and no man works like he does. And in the same way with the soldier, every penny

that we give him in the way of food will diminish his sickness and his drunkenness, and it will be a capital investment. I say the measure of his drunkenness is the measure of his want of food. And also another thing is his tobacco; the soldier is perpetually smoking. I think his drinking and smoking are his attempts to satisfy his demands for food. When I have a man brought before me suffering from drink I say to him, "How much do you lay out for extra rations?" He says, "Not much." I say, "You must eat plenty of food and take less beer." Less beer and more food is quite the true principle to go upon.

And I should like to point out how one class of men has settled the question about rations, that is the serjeant class. The soldier is paying from 3½d. to 4½d. a day for his rations, but the serjeant is paying sometimes from 6d. to 7½d. But is the serjeant a harder worked man than the private? I do not know that he is physically; but he, too, wants more food, and the measure of the serjeant's money is what the soldier wants; he wants 4d. extra given him in pay or allowances to make him a better fed man. And you see it in this way. The moment a serjeant is broken, and put back in the ranks, he is pulled down at once by the want of food.

And as regards the question of men going to the different recreation rooms (which is growing up more every day) to get some more food in the evening, I would like to say that it is working up towards one thing which we have and the serjeants ought to have. What would our life be without our mess dinner? It is working up towards a good substantial evening meal for the soldier. I cannot think why the serjeants do not have an evening meal. They say it would cost too much; but it would keep them out of harm's way. When a man is eating he is in a very safe condition. The "liver" comes much more from drinking than from food. I was for several years medical officer of a great military school, and those years acted upon my life enormously, I shall never forget them. When I went there I found those young growing boys getting dinner, just like the soldiers, at a quarter-past 2 o'clock in the day, and they were left all the evening to their own devices—as to food supply—with very bad results. I say that for a man to live on lobsters, sardines and salmon, and that kind of indigestible food in his bedroom at night is a defective system. I say that the tea squad system was a defective system—and I know it because the cadets come before me ill, and I say that whatever I have done in my service there is nothing that I congratulate myself upon more than

that I was able, by constant and reiterated reports, to get that late dinner for them; and it is a perfect success, I think, in every way. The soldier, I maintain, who is wandering round the town now looking about for amusement, and also, I think, looking perhaps for food, would be a happier and a better man if he got a good meal in the evening.

I would say a word also about the cooking. Throughout nearly the whole of the Woolwich garrison the preparation of the food of the men is still done in the barrack-room. We have reports continually of the lavatories being choked by pieces of vegetables and potato skins. And the dishes are not made in the kitchen under the surveillance and instruction of the master cook; he is devoting his whole time to watching the consumption of the coal, whereas he ought to be, and is sometimes, instructor of the cooks. The dishes are often made up by the men by roster, and there is not much real development in this most important art of cookery; and the result is that the serjeant cook, a trained specialist from Aldershot, is below watching the coal instead of watching the actual preparation of food. This is a matter that might well come before you. Then you ask, perhaps, is there room enough in the kitchen to do all this? it is very small. Well, a kitchen should be devised with a preparation-room outside of considerable size, airy, and clean, where the dishes could be prepared. And I think also that the day is rapidly coming when you should have a dining-room for the men, and if I could devise such an arrangement in my fancy's eye I see before me in the future a receiving-room for rations, opening next into a large room for preparing the food under the eye of the master cook, then passing by a door into the cooking-room, and then passing away into the dining-room, where the men would sit down and eat their meals (not as they do now in the bed-rooms), and that same dining-room, if it were properly warmed and lit, would keep the men together in the evening. Of course, the battery unit and the company unit are very important to preserve; and this company dining-room and battery dining-room, would, I think, be a great improvement for the soldier.

As to the comfort and appearance of the barrack-rooms much still remains to be done—and while referring to this point I may quote the opinion of Lord Wolseley, who allows me to publish his remarks. He says, "When I came to Ireland over three years ago, I gave orders to have not only the hospitals but all the barrack-rooms tinted a pleasant hue. I find it takes away the

prison look from our barracks, which I regard as most essential, and now that coloured pictures of a very interesting and pleasing nature can be obtained cheaply, there is no reason why every company should not make its barrack-rooms homely and comfortable."

"We pay our men so wretchedly that we can only hope to entice men to enlist by making them happy whilst they are with us, and the first step towards happiness is to make men's dwellings bright and cheerful. We have done much in recent years to improve the condition of our men, but much, very much, remains to be done."

One last word, about the question of punishments. When I first entered the Service soldiers were continually being tried for habitual drunkenness. I used to keep ready in my room dozens and dozens of court-martial certificates, and the regimental court-martial had lost its prestige because it was doing the work that the Commanding Officer since is doing so much better. What was the result of the system? You put a man in prison, and you put his work upon his comrades. I would say to you that so far as my experience goes long terms of imprisonment have done enormous injury to the soldier. When he comes out the man has lost strength, he plays about between you and between us; he is here, he is in prison, he is in hospital. I think, myself, the fining system for drunkenness was a tremendous boon, because the man went back at once to his duty—he did not throw it upon his comrades—and to his rations; and I am sure he was a better man than he was made by long terms of imprisonment, and I hope the day will come when you can get rid of those long imprisonments out of the Army.

Long terms of imprisonment in Indian military prisons, often for unimportant crimes, act with highly injurious influence on the soldier's health and his fitness for the battle of life after the soldier leaves the Army. I cannot think that anything more than one year's imprisonment should be given to a soldier in an Indian military prison—for if you do give him longer terms he becomes so enfeebled as to be liable to all tropical ailments, and eventually he is thrown on the English labour market, weak and broken down, and sinks into the useless soldier tramp we all know so well.

I hope the day is rapidly coming when simple expulsion from the Army will in itself be a most serious punishment, just as the expulsion of a constable from the police force is a real blow to

any man who undergoes it. The least rise in the soldier's pay will tend to bring about that happy consummation.

I would say, finally, that we want above all things to combine in this work. I have no power to speak in the name of the Medical Service; but I say emphatically that our whole desire is that every want that you have should be met. If up to the present time there have been troubles and difficulties in the initiation of a new system, I would beg you to remember that our whole aim is to come back to you and to do more for you than the regimental doctor ever did, but we must remain a unified corps.

Reviews.

LIFE AND LETTERS OF SIR JOHN HALL, K.C.B., M.D., F.R.C.S. By S. M. Mitra. London: Longmans, Green and Co., 1911. Pp. xxvi and 560, 16s net.

This book, by the well-known author of "Indian Problems," and frequent contributor to the Reviews, is stated to be the first biography of an Englishman to be written by a Hindu. It is also the first attempt to furnish the public with an account of the working of the Medical Department in the Crimea, based on the private papers of the Principal Medical Officer. Sir John Hall had kept memoranda and diaries with the intention of compiling a history of his department during the war, but failing health prevented the fulfilment of the task now undertaken by Mr. Mitra.

John Hall entered the department as a hospital assistant in his 20th year, a few days after the battle of Waterloo, and was attached to the General Hospital in Brussels. After his return to England he served for twelve years in Jamaica, passing through the yellow-fever epidemics of 1819 and 1825, and himself contracting the disease. He was for many years surgeon of the 33rd Regiment; of which fact he remarks: "at the reduction of the medical staff in 1829, I, a staff surgeon, was appointed surgeon of the 33rd Regiment, against my wishes, and in that inferior capacity I served from 1829 to 1841." After service at home, in Gibraltar, and in Barbadoes, he was promoted to be Deputy-Inspector-General in 1846, and went to South Africa as Principal Medical Officer.

Here he served through the Kaffir Wars of 1847 and 1850; being present under Sir Harry Smith at the affair of Boom Platz, where the emigrant Boers under Pretorius were defeated, and crossing the Vaal founded the Transvaal State.

At this time Hall's diary is very full and there are many long letters to his future wife, and to Sir James McGrigor, who was still Director-General. In one of them a scheme is mentioned in which Sir James was much

interested, that of moving the library and museum of the Department from Fort Pitt, Chatham, to London, where he hoped it might form a meeting place for his officers. For this purpose he started a Building Fund which apparently met with very liberal support, at a time when the rate of pay was much lower than now. Thus, with one exception, every officer at the Cape contributed either eight days' pay, or a donation of money, the whole amount there subscribed amounting to £116.

Allusion is made to the excitement caused at the Cape by Lord Grey's order to convert it into a penal settlement. On the arrival of the first batch of convicts a widespread combination was formed by the inhabitants to starve the Army, Naval and Civil servants. The boycott failed in its immediate object, but the convicts were sent on to Van Diemen's Land.

The villages of Rondebosch and Wynberg were then much frequented by those on sick leave from India, as they continued to draw their Indian pay and allowances. Hall remarks that they seemed to be viewed as fair game for pillage, to which their own vanity and love of ostentation rendered them easy victims. In 1851 he left the Cape for India as Principal Medical Officer, Bombay Presidency; Sir Harry Smith, who had the highest opinion of his abilities, publishing a most complimentary general order on his departure. This appointment Hall held till the end of April, 1854, when he was ordered to proceed direct to Constantinople, "having been selected for the medical charge of the forces now proceeding on a particular service to the east of Europe."

When he arrived at Constantinople in the middle of June, the army was on the move to Varna. Coming direct from India he had had no voice in the selection of his officers, nor in the medical preparations for the campaign. Indeed, he was unaware of the strength of the force to be employed. But, from his experience in South Africa he knew that the lessons of the Peninsula had been forgotten in the long years of peace, and that many of the component parts of the Medical Department could hardly be said to exist, and would have to be improvised in the face of the enemy. For this state of affairs it is now recognized that the then Director-General, Dr. Andrew Smith, was not to blame; his position at the War Office was such a subordinate one that his recommendations and appeals met with no response from the Horse Guards.

Nevertheless, when the storm of public indignation raised by Russell's letters burst, not for the last time in history was the Medical Department made the victim. Of those letters it has recently been well said by the *Times* that they "were primarily an attack upon an obsolete system, but were taken up by those who were responsible for the existence of that system, and used to attack those who were responsible for administering it." Of this personal attack and public criticism, Hall, as Principal Medical Officer, had to bear the brunt. With what courage and success he met attacks from every quarter ample witness is borne by these temperate and dignified letters.

The terrible losses from diseases in the first winter in the Crimea were the result of excessive over-work, exposure, and lack of shelter, fire, food, and clothing on troops already debilitated by their insanitary surroundings in Bulgaria. For this the medical department was not responsible. Hall's recommendation as to sites and shelter were disregarded; and at the root of the difficulties in supplying even the barest necessaries of life, and of removing the sick, was the total lack of transport

from the coast to the camps and vice versa. But throughout the campaign the Principal Medical Officer seems to have received little help from the head-quarter staff, and to have been kept strangely in ignorance of even the most important movements.

Thus, having received no information from the Quartermaster-General as to the move from Varna to the Crimea, which was a matter of common camp gossip, Hall writes to him on August 11, as follows:—

"In the event of the army embarking in force I beg to state that conveyance will be needed for at least 400 tons of medical and purveyors' stores, besides the wagons, men and horses of the ambulance train; and it would be convenient, if it could be so arranged, to have the whole shipped on board the vessels that are to be employed as hospital ships."

To this he received no reply till a fortnight later, when the expedition was within a few days of sailing. Had the recommendations in this letter been carried through the great suffering caused after the Alma, and on the march to Balaklava, from the entire lack of ambulance transport, would have been avoided. As it was, this deficiency was one of the principal causes of the popular outcry against the Medical Department. It is fully dealt with in Hall's detailed reply to the Commissioner's Report, which will be found at the end of this book.

In like manner he was told nothing till the last minute of the various minor expeditions to Kinburn, Kertch and elsewhere; and till the very end of the campaign received no adequate information as to the sailing of transports and hospital ships, personnel and equipment for which often had to be provided at a few hours' notice.

The following letter to the Director-General, written in December, 1855, throws some light on the working of the regimental system:—

"Sir William Codrington evidently seems to think that commanding officers, brigadiers and generals of division are all ready and eager to do anything and everything for the benefit and comfort of the sick, and that the doctors want to set themselves up as an independent body—an *imperium in imperio*. Of the want of assistance and support the instances are too numerous to mention. If the doctors were independent, it would be the better for the sick, and we should have escaped much of the odium that fell on us last winter.

"Commandant of Artillery, Sir Philip Dacres, will not be approached by Superintendent-Surgeon Elliott with anything in the shape of a demand for the comfort and well-being of the sick, unless it comes through the captain of the troop or battery, and the colonel commanding the division. But the consequence is that these gentlemen are occupied with their own especial duties, and, without perhaps any intentional neglect, they either do not understand, or do not think of the wants of the sick, for which they know they are not held responsible, and nothing is done.

"On Saturday I had occasion to visit some of the hospital huts of the Artillery, and found them in a wretched state of disrepair, and the sick suffering great discomfort. This I represented to the Chief of the Staff, for the Commander-in-Chief's information, which brought me a letter from Sir William Codrington, which I did not quarrel with, as it has had the desired effect; but Sir William is under a wrong impression if he thinks regimental officers set their commanding officers at defiance, and apply to me for assistance in the first instance.

"That I believe is never the case, and no application is ever made to me until every other local means has failed. I feel, unless we make an effort to right ourselves we shall, to the end of time, be made the victims of public odium in the way we were last winter, being held responsible for things over which we have no control. The poor, suffering, sick soldier is a fine horse to ride off on, but the hobby has been ridden to such an extent, and at such a furious rate, that even the *profanum vulgus* are getting sick and tired of it."

The labours of the Principal Medical Officer must have been greatly increased by the correspondence involved in replying to the innumerable complaints which reached him in despatches from the home authorities, who seem to have been as ready as was a part of the Press to swallow any exaggerated story. Here is an extract from a despatch sent by the Duke of Newcastle, at that time Secretary of State for War, which is suggestive of the emotional excitement prevalent even in the highest quarters :—

"It is stated that the first batch of 3,300 sick sent to Scutari on December 11, embarked on board the "Sidney," and that the poor creatures had to crawl up the ship's sides as they could, without a medical officer on board to receive them, or a single soul to assist them."

Not only were such stories sent home, but the pseudo-philanthropists carried their complaints direct to the Commander-in-Chief. Hall gives a specimen :—

"The day before the unsuccessful assault on the Redan, on June 18, 1855, all the arrangements, I presume, being considered complete, an officer of rank went down to the purveyor's store at Balaklava to inquire if there were any wooden legs, and finding there were none, which was not surprising, as they are never kept there, he made a report of the circumstance to the Commander-in-Chief, and I was sent for by Lord Raglan and questioned on the subject. My answer was that I could not say exactly from memory what number of wooden legs the apothecary, whose business it was to take charge of such articles, had in his store at Balaklava, but it was matter of little moment, as I knew there were plenty at Scutari, from whence they could easily be obtained if required, and I need hardly remind his lordship that we could not cut off a natural leg and clap on a wooden substitute at once. His lordship smiled, and said, 'Of course not,' and there the matter ended."

Sir John Hall had also to conduct a voluminous correspondence with Miss Nightingale. The author regrets that her executor has refused permission for publication of her letters, but there are many here from the Principal Medical Officer to that lady, from which it would appear that not the least of his troubles were those connected with the nursing service.

His biographer tells us that Hall had not even a secretary, and that after being occupied with correspondence of all kinds till the small hours, he was often in the saddle at 6 a.m.

In spite of this incessant strain he was not absent from duty for a day throughout the whole campaign, but his health broke down upon his arrival in England. He never recovered it, and, after spending several years on the Continent, died in 1866.

Mr. Mitra, for the most part, allows the original papers to tell their

own tale; and nothing could afford a more complete vindication of Sir John Hall, or show more clearly the overwhelming difficulties with which the Medical Department had to contend in the Crimea.

The preparation of this work must have entailed an enormous amount of labour on one who is not an Englishman, and our thanks are due to Mr. Mitra for having, after half a century, done justice to the memory of a distinguished officer of the Corps, of whom it can be truly said—*In arduis fidelis.*

J. T. C.

A MANUAL OF DISEASES OF THE EYE. By Charles H. May, M.D., New York, and Claud Worth, F.R.C.S. Third Edition. London: Baillière, Tindall and Cox, 1911. Pp. 427. Price 10s. 6d. net.

The third edition of Messrs. May and Worth's manual has been carefully revised and brought up to date, a noticeable new feature being a chapter on "The Use of Vaccines in Ophthalmology," by Mr. S. H. Browning, Bacteriologist to the Royal London Ophthalmic Hospital.

The manual is not intended for specialists or would-be specialists, but aims at giving the fundamental facts of ophthalmology, "always keeping in mind that the book has been written for students and general practitioners." Common diseases of the eye are therefore treated with fullness, while rare conditions are merely mentioned or dismissed in a few words. The illustrations are numerous and excellent (366, of which 71 are coloured), and really fulfil their function of elucidating the text. The chapters on "Concomitant Squint," "Heterophoria," and "Operations on the External Ocular Muscles," are, as might be expected from the authorship, particularly useful.

A manual of this nature can hardly be considered complete without an appendix giving the vision regulations for the various public services; this is a defect in the work under notice, which it is hoped may be remedied in future editions.

The work can be cordially recommended to the class of reader for whom it is written.

M. T. Y.

THE NEW PHYSIOLOGY IN SURGICAL AND GENERAL PRACTICE. By A. Rendle Short, M.D., F.R.C.S. Wright and Son, Bristol. Pp. vii and 201. Price 4s. 6d. nett.

This excellent little book is prefaced by the remark that its contents are intended for the general practitioner, the consulting surgeon, and candidates for the higher examinations in physiology.

The first chapter is devoted to a description of the functions of the thyroid and parathyroid glands, and the relation between iodine metabolism and goitre is clearly and convincingly established.

The pituitary gland is next dealt with, and the value of its extract in cases of surgical shock is emphasized. The effects of the extract given hypodermically are compared with the use of adrenalin and ergot, but its relation to "heracleophorbia" is not fully established.

A chapter on "Digestion and Absorption" gives the reader a clear and crystallized view of the more recently accepted ideas on these functions. The researches of Pawlow, Starling, and Edkins are freely

used to illustrate the more important functions of the stomach; while the value of the colon as an organ of absorption is definitely and, may we hope, finally determined.

A short *résumé* of the physiology of blood-pressure contains much that is interesting, and it is a pleasure to read the author's opinion, expressed in no faltering words, as to the uses of vaso-constrictors in hæmoptysis. This is followed by a disquisition on the hæmorrhagic diathesis; but here physiology has little new to offer, since Sir Almroth Wright's work on the times of coagulation.

Chapter VII is devoted to the conditions occurring in diabetes, acidosis, and acetonæmia. The mechanism and chemistry of these conditions are well discussed, and their treatment clearly outlined.

In dealing with nerve injuries and the physiology of the spinal cord, the author gives an excellent, though compressed, description of nerve functions, dealing more fully with the theories of nerve regeneration.

The book concludes with a chapter on cutaneous anæsthetics. This is so short and undeveloped as to be of little use to the student. It is a matter for regret that this subject was not either amplified or omitted.

Of the rest of the book we can only speak in praise. The author has the happy knack of stating his meaning clearly and succinctly, and is equally fortunate in his use of illustrations.

It will be a great help to those faced with a promotion examination, and a source of pleasure to others interested in modern physiology.

J. W. H. H.

SYPHILIS FROM THE MODERN STANDPOINT. By James McIntosh, M.D., and Paul Fildes, M.B., B.C. Edward Arnold, London, 1911. Pp. xvi and 227. Price 10s. 6d.

It is in every way desirable that all who have to deal with syphilis should know how far laboratory tests can assist them in the diagnosis and management of this disease. Hitherto it has not been easy for anyone to acquire this knowledge rapidly, since most of the literature has been scattered in innumerable journals, chiefly continental; and there was urgent need of a book, such as the present, which contains in a small space most of the reliable facts relating to syphilis from the pathological standpoint. Those who know what an enormous amount has been written on the *Spirochæta pallida* and the Wassermann reaction within the past few years will realize that the authors' task has not been a light one; in fact, it would have been impossible for any one who was not an expert to have selected the reliable from the worthless matter so well as they have done in this volume.

The history of syphilis is followed by an account of the characters of the *S. pallida* and the method of its demonstration, an account of experimental syphilis and the pathological changes which follow infection. This section ends with a discussion of the problem of immunity, and is followed by a careful description of the Wassermann test, which will be found useful by the pure clinician and the pathologist alike. To the former it will give an insight into the true significance of the Wassermann test, and to the latter, especially if he has not hitherto devoted any great attention to this branch of his subject, it will be a reliable and practical guide to the work which has already been done. The book concludes with a section on the treatment of syphilis with salvarsan. This, as well as the chapters

on the Wassermann reaction and the histo-pathology of syphilis, contains much original work by the authors, which greatly enhances their value.

There are a few points in which we think this otherwise excellent work might be improved in future editions. In stating the requirements for a good dark background, the authors emphasize the necessity of avoiding air bubbles in the preparation itself, no great matter if there are not too many of them, and quite omit to mention that a very minute bubble in the oil between the slide and condenser if it is near the centre will spoil the background. We should also have thought that the other chief form of dark-ground apparatus, the management of which differs in some important details from that of the Zeiss pattern, was worth a description. The directions for making up and using Leishman's stain are not correct. The authors' directions are to dissolve 0·1 grm. of the powder in 10 c.c. of methyl alcohol, allow to fix for one minute, and then add an equal volume of distilled water; so that it is not surprising that they obtained uncertain results with this stain. In discussing the quantitative methods of performing the Wassermann test, they conclude that variation of "antigen" gives no index of the strength of a serum in Wassermann substances. We do not agree with this, since in testing sera after salvarsan treatment we have found, and too often for it to be a mere coincidence, that the last indication of the Wassermann reaction to disappear, and the first to reappear in relapse cases, has been the reaction with the larger amount of extract in Stern's test. The reader is given no choice of methods of administering salvarsan intravenously, only one apparatus, the authors', being described. This course lays it open to the criticism that it is not the best form to use under all circumstances. In tropical climates, where rubber perishes easily, we can easily imagine there would be trouble with the rubber pump, which is very like a Higginson syringe, and we also think it a disadvantage that the injection of salvarsan solution is not preceded and followed by that of some salt solution; we attribute to this the local troubles, doubtless slight, which the authors mention as following the injection. The authors lay stress on inserting the needle with the bevel down. As the shape of the needle point makes it conform to the laws affecting chisels, we should say that the bevel should be up for easy penetration of the vein wall, and that bevel down would tend to make the needle run along the anterior wall of the vein, especially if it were a little blunt. As a matter of practice based on many thousands of venipunctures, we find that bevel up is easier, though it is an advantage to turn the needle over when it is inside, so that the vein wall may not block it.

In spite of these points in which we do not agree with the authors, we think this is a book which everyone should read who wishes to treat syphilis intelligently.

L. W. H.

MILITARY LAW EXAMINER. By Lieutenant-Colonel S. C. Pratt. Eighth Edition. Gale and Polden, Aldershot, 1911. Pp. x and 306. Price 4s. 6d. nett.

This work, which has been brought thoroughly up to date, should prove of great assistance to any one studying military law for the Service examinations. Most of the questions selected have been set at one or other of the Service examinations of recent years (a marginal index denot-

ing which). If worked through conscientiously these questions are calculated to familiarize the candidate with the subject and prepare him for examination by teaching him the manner in which questions should be answered, what references should be given, and at the same time impressing the more important points on his memory. The volume is handy in size and covers a wide field; it is conveniently arranged with clear headings and sufficient references to the authorities are quoted to satisfy any examiner. G. G. D.

Manual of the St. John Ambulance Companies. By Lieutenant-Colonel G. E. Twiss, R.A.M.C. (retired). Pp. 152; 43 illustrations, $5\frac{1}{4}$ in. by $3\frac{3}{4}$ in. Published by the St. John Ambulance Association, London. Price 6d.

This little manual has been written for the guidance of commandants when training their companies.

The first chapter is introductory, it sets forth the objects for which the companies are formed, and describes the various medical units which these companies may be asked to establish. The duties of each rank in peace and on mobilization are clearly laid down; a list of the equipment which a company should possess is also given.

Chapter II deals with the laws and customs of war.

The next chapter discusses buildings suitable for use as hospitals, and shows (with diagrams) how a school may be converted into a hospital. This scheme should be most valuable for voluntary aid companies as the author has shown all the indispensable annexes, e.g., kitchens, latrines, pack store, &c., which are very likely to be forgotten when improvising a temporary hospital. The chapter also contains a list and description of the books which must be kept in a military hospital.

Chapter IV deals with nursing and contains practical instructions for non-professional nurses. The first few pages of Chapter VI, the first page of Chapter VII and the whole of Chapter VIII might well have been included in this one.

Chapter V takes dieting and cooking in hospitals and in the field. The next chapter deals with rest; the portion on "shelters" would have been better placed in the chapter on "improvisation."

Chapter VII is headed "cleanliness" and comprises a variety of subjects—e.g., washing a patient, protection of food and water, disinfection of rooms and patients' excreta.

Chapter IX deals with transport. It opens with the Royal Army Medical Corps stretcher drill and then describes transport by improvised means.

The last chapter, that on improvisation, gives some good illustrations of knots, but is not otherwise very full. The old-fashioned field latrine seems a little out of place in this chapter.

The manual should prove of great assistance to those engaged in training St. John Ambulance companies. In future editions the matter might with advantage be re-arranged as suggested above.

C. E. P.

Esquisses Cliniques de Physico-therapie. Par le Docteur J. A. Rivière. Pp. xii and 308; 76 illustrations. Paris: Bouchy et Cie., 1910. Fr. 7.50.

The first part of this volume consists of eleven chapters, treating of the therapeutic uses and virtues of physical agents, including electricity,

air, ozone, water internally and externally, light, heat, mechanical movement, and gymnastics. Later chapters deal with the various conditions for which such remedies are used. These range from neurasthenia and obesity to scoliosis and cancer. Illustrations and diagrams of apparatus are appended.

The author's aim appears to be to urge the use of physical means in opposition to drugs. At this time of day this is hardly necessary, and the only thing at all likely to discredit the remedies he vaunts so highly is the indiscreet application of them to unsuitable cases by their too enthusiastic advocates.

C. G. S.

Current Literature.

On the Stimulation of Antibody Elaborating Organs.—Lippmann (*Deutsch. med. Woch.*, September 14, 1911, p. 1693), immunized a series of animals with dead emulsions of the typhoid bacillus. For four months the agglutinative power of the blood remained high at a constant level. A hypodermic injection of 0·1 grm. of arsacetin then caused a sudden rise in the agglutination curve which attained its maximum in about seven days. He notes that the work of previous investigators has shown that antibodies are elaborated in the bone marrow, lymphatic glands and spleen. In cholera, for instance, they exist in four times as great a quantity in the spleen as in the blood. While there are many agencies, such as cold, hunger, fatigue, alcohol and other poisons which retard, there are but few which hasten the production of protective substances. Among the latter are warmth, high altitudes, pilocarpin, hetol and arsenical preparations and venesection.

C. B.

Antitoxin Treatment of Diphtheria.—Hoesch (*Deutsch. med. Woch.*, September 14, 1911, p. 1683) deprecates the use of very large doses of diphtheria antitoxin. He recommends 1,000 to 2,000 units in mild cases, 3,000 to 4,000 in severe. He has observed no benefit arise from the administration of adrenalin, or adrenalin and saline fluid advocated by Meyer. The antitoxin should be injected at the earliest moment possible.

C. B.

On the Curative Power of Quinine Derivatives.—Morgenroth and Halberstædter (*Berl. klin. Woch.*, August 21, p. 1558) have made systematic investigations on the action of quinine derivatives in experimental trypanosomiasis. They find that hydro-quinine and ethylhydrocupreine, to some degree, exercise a preventive and therapeutic effect in the animal infection. They think that these substances in combination with other trypanocidal agents might be used in the human disease. Morgenroth and Levy have experimented with ethylhydrocupreine on mice inoculated with a tenfold lethal dose of pneumococci. They have saved a small proportion of the animals. They claim that this is the first occasion on which a virulent bacterial infection has been aborted by chemical means.

C. B.

Vaccination against Trypanosomiasis.—Teichmann and Braun (*Berl. klin. Woch.*, August 21, 1911, p. 1502), state that they have prepared a vaccine from dead trypanosomes which is able to protect mice from an otherwise fatal invasion, and that they have obtained an anti-trypanosome serum by immunizing animals with it. C. B.

Silver-Atoxyl in Sepsis.—Eisenberg (*Berl. klin. Woch.*, September 4, 1911, p. 1643) states that this substance has been injected subcutaneously in gonorrhœal rheumatism with good result. Hirsch also has published a case of sepsis in which it was successful. Silver-atoxyl is atoxyl—the sodium salt of para-amidophenylarsonic acid—in which Ag takes the place of Na. It contains 33 per cent. of Ag and 23 per cent. of As. Eisenberg employed it in a patient who had been so reduced by six weeks' rigors, fever and sweating that death appeared imminent. Complete recovery ensued after a dose of 0·3 grm., emulsified in oil and injected subcutaneously. An abscess formed at the site of the injection. C. B.

Salvarsan in Bilharzia.—Joannides (*Deutsch. med. Woch.*, No. 34, 1911), claims that he has cured eight cases of bilharzia by means of an intramuscular injection of 0·6 grm. of salvarsan. In *Bul. de la Soc. de Path. Exotique*, January, 1911, p. 45, it is recorded that salvarsan is of no value in this disease. This corresponds with the experience of the reviewer, who found that the ova were as numerous four months after an intravenous injection of salvarsan as before. C. B.

The Treatment of Syphilis with Joha and Mercury.—Schindler (*Berl. klin. Woch.*, September 4, 1911, p. 1647) has given the name Joha to an oily emulsion of salvarsan which, he says, is not deteriorated by keeping, even in the Tropics. He claims to cure 85 per cent of his cases in fourteen days by means of two intramuscular injections each of Joha and mercurial cream which together represent 1 grm. of salvarsan and 0·56 grm. of mercury. He, however, does not state the number of patients thus treated. C. B.

The Reaction after Salvarsan.—Marschalko (*Deutsch. med. Woch.*, September 14, 1911, p. 1702) states that by the use of only 0·5 per cent. sodium chloride in water free from bacteria, living or dead, he has suppressed the reaction after intravenous injection of salvarsan in sixty-seven cases. C. B.

The Dimethyl Sulphate Test of Creosote Oils and Creosote Dips; a Substitute for the Sulphonation Test. Robert M. Chapin (U.S. Department of Agriculture, *Circular* 167, June 30, 1911).—The dimethyl sulphate test herein described is intended to serve as a useful sorting test, leaving the sulphonation test to be employed as a check in more doubtful or important cases. It is claimed that it yields quick, clean and definite results even in wholly inexperienced hands, and requires but a minimum of apparatus and manipulation. After carrying out the method as described we have certainly found this to be the case. The sulphonation test usually employed in most laboratories requires considerable skill and care and entails the manipulation of comparatively large quantities of concentrated sulphuric acid.

The dimethyl sulphate test is principally applied to creosote sheep

dips and in the Biochemic Division of the Bureau of Animal Industry it has been found to be a helpful aid in arriving at certain data valuable in determining the source of origin of creosote oil. As sheep dips contain resin, which on heating decomposes and forms resin oil, which itself is but partially soluble in dimethyl sulphate, the test must only be applied to a fraction distilling between 240° and 270° C.

As the extraction of sufficient oil to allow of fractional distillation is tedious and involves the use of considerable quantities of ether, the author found that the test could be simplified by applying it to the oil separated by ether and potassium hydroxide without previous distillation.

In practice, the examination is carried out as follows: Between 20 and 50 grm. of dip, depending upon the character and scope of the subsequent examination, are treated with ether and caustic potash solution by shaking in a separating funnel, until separation into two layers results. The upper ethereal layer is washed with potash solution and water, the ether distilled off, and the hydrocarbons present in the dip, now freed from resin and tar acids, will be thus rendered susceptible to thorough examination; 5 c.c. are pipetted into a narrow 25 c.c. burette and shaken with 8 c.c. of dimethyl sulphate after closing the burette with a close-fitting cork. Separation of the residual oil occurs in a short time in the form of a clear, supernatant liquid layer, which if dark, as sometimes happens, should be looked for by reflected light. If the result is negative it is certain that the dip contains neither any large amount of creosote of doubtful origin nor petroleum oils. If the result of the test is positive and further information is desired, a sample of the dip should be subjected to distillation by one of the two ways described in the Circular and a test made on the fraction distilling between 240° F. and 270° C. W. W. O. B.

Suggested Iron Ration for the Russian Army. — In the *Voenni Sbornik* (Military Magazine) for September, 1911, appears an article by v. Mikini containing suggestions for an "iron ration" for the Russian army. The article is not written for the medical profession alone, and while entering into the scientific aspect of the question, the author endeavours to make this clear to those whose previous knowledge of the subject is small. He points out the advantages of issuing an emergency ration carried on the person and used only on the order of an army commander. He lays down that such a ration should be (*a*) light and portable; (*b*) not liable to be spoilt by keeping. Furthermore, that it should be (as in the case of an ordinary ration) sufficiently nourishing, digestible, and pleasing to the taste.

He gives the following table showing the composition of the Russian Army ration:—

RUSSIAN ARMY RATION.

		Albumins	Fats	Carbo-hydrates (starch)
In Peace—	grm.	grm.	grm.	grm.
Meat	205	33·6	13·4	—
Bread	1,228	73·6	6·0	567
Buckwheat groats	136	12·0	1·0	75
In War—				
Meat	409	67·2	26	—
Bread	1,024	61	5	472
Buckwheat groats	136	12	1	75
Suet (&c.)	38	1	27	—

From this table it is seen that the Russian soldier receives in time of peace as well as in time of war a sufficient amount of proteids and a much greater amount of carbo-hydrates than are theoretically required to maintain his bodily strength. But the ration of tinned meat, though satisfactory in quality as an ordinary war ration, is unsuitable for an emergency ration on account of its weight, which is largely due to its high proportion of water (55 per cent). Moreover, the tins of meats are in practice not carried on the person of the soldier, but in regimental and divisional transport. The emergency ration (or what serves as such) of the Russian soldier consists of half a Russian pound of preserved meat and two Russian pounds of *sukhar* daily (a Russian pound = 0·9 lb. English). The *sukhar* is dried rye bread; the word is frequently translated as "biscuit," which in one sense is a good translation, but a Russian would describe our army biscuit as *galet*.

Considering that the meat ration is carried in the transport, and that the *sukhar* is not (on account of its composition) suitable as the sole component of a ration, the Russian soldier cannot be considered as well provided for in all emergencies. The composition of *sukhar* is stated to be 13·1 per cent water, 10·86 per cent proteid, 2 per cent fat, 70·21 per cent non-nitrogenous material, 1·78 per cent gelatin and 2·05 per cent mineral salts.

The composition of biscuits made from a mixture of rye and wheat flour and of an ordinary European military biscuit made from wheat flour with 30 per cent of husk are given in comparison, as also the composition of German, French, and Austrian emergency rations. The writer of the article considers that the question as to the provision of a suitable emergency ration has been satisfactorily settled in the French, German, and Austrian armies. He states that the difficulty in introducing a similar ration into the Russian service is that the Russian soldier does not like pea-flour: the postulate as to the palatability of a ration would not, therefore, in his case be satisfied. Such vegetables as he prefers, potatoes, cabbages, &c., are useless for the purpose of providing an emergency ration rich in proteids.

The author considers that a good solution of the difficulty is found in the provision of "albuminized bread." The idea is not new, and many experiments in this direction have been made, by the admixture of meat, &c. But the most satisfactory albuminized bread has been found to be that in which the extra proteid is supplied by the admixture of ox serum: this bread has been supplied to "out-of-works," and has been otherwise the subject of practical experiment. The serum is obtained simply by straining the coagulated blood of oxen killed in abattoirs. In order to make the bread 10 lb. of rye flour are mixed with 5 lb. of serum and ½ lb. of yeast is added. When the dough has risen, 6 lb. of rye flour and 6 lb. of serum are added. The freshly-mixed dough is for the requisite period of time placed where warmth may aid the action of the yeast, salt is added, and baking is carried out in the usual way. The bread may be dried to make *sukhari*, just as ordinary rye bread may be dried.

The cost of the serum is very little; at the present time vegetable albumin is used in manufactures, to the exclusion of animal albumin, and blood is not a normal article of food in Russia as it is in some countries. The supply is plentiful: 600,000 head of cattle are killed

yearly in one abattoir in St. Petersburg alone. No special mechanical arrangements are required either for making or storing the bread.

The albuminized bread so prepared is as regards taste indistinguishable from ordinary rye bread. White (wheaten bread) has a slightly rosy tinge, if prepared by the admixture of serum instead of water, but this is not noticeable in rye bread.

The albuminized *sukhar* keeps very well; if albuminized biscuits (*galeti*) are required they may be made by mixing the flour with serum as for bread making.

Eight hundred grammes of *sukhar*, albuminized as indicated, are stated to contain 221 grammes of proteid, and 576 grammes of non-nitrogenous food material.

It is not proposed that the meat ration (of frozen or tinned meat) should be lessened or withheld on account of any issue of albuminized bread, but it is considered that this kind of bread in the form of *sukhari* would be suitable as the main component of an emergency ration, as being in itself a good food for men in hard work.

The complete emergency ration would consist of tea, sugar and preserved bouillon (in the form of cakes), in addition to the albuminized bread. Tea-making is considered in Russia to be the practical solution of the water question on active service, and the meat extract is included on account of its valuable stimulant qualities. G. S. McL.

Sterilization of Water by means of Ultra-violet Rays.—*The Zeitschrift für Hygiene und Infektionskrankheiten*, vol. lxix, part 1, contains two papers by Dr. L. Schwarz and Oberarzt Dr. Aumann on the "Treatment of drinking water by means of the Ultra-violet Rays." In the first a series of experiments with the mercury vapour lamp of the *Hanau-Quarzlampengesellschaft* are described. In this lamp the mercury is enclosed in a double-walled tube of quartz glass, and is intended to burn under water. Unless immersed the temperature rises so rapidly as to injure the lamp, and this accident occurs sometimes even when it is in the water. The length of the arc is 6 cm. (2·4 in), the current necessary is one of 4 amperes at about 80 volts pressure. The candle power is 1,800. The current must always be passed in the same direction, and the poles should invariably be tested with pole-test-paper to ensure that this is the case after any alterations in connections have been made. The lamp should be so arranged that the anode end only can be raised for the purpose of lighting; the cathode must be left fixed. The first experiments were made with still water to ascertain the shortest possible time in which complete sterilization could be attained. The sterilizing vessel, which measures 8 in. × 3·4 in. × 3·2 in., was carefully cleaned and then filled with clear tap water, to which a carefully strained emulsion of one loopful to a test organism (*Leucht vibrio*) in tap water was added. The raw water contained about 2,000 organisms per centimetre, which number was reduced to 700 in five seconds, 15 in ten seconds, 8 in fifteen seconds, and nil in twenty seconds. In twenty-five seconds no organisms were found in 200 c.c. It was impossible to continue the experiment beyond thirty seconds owing to the great heat evolved. A distinct odour of ozone was perceptible after the current had been running twenty seconds. For experiments with running water the sterilizing chamber was connected with a tank holding 200 litres of

water. It was first ascertained, by experiments with fluorescin, that with a delivery of 1 litre per minute the water took six seconds to traverse the sterilizing vessel, the period being three seconds with a 2-litre delivery. The period during which the water would be actually under the influence of the rays was thus much shorter than that which the previous experiment with still water had shown to be necessary, ensure complete sterilization, viz., twenty-five to thirty seconds.

Working at the more rapid rate, that is with an exposure of the water equivalent to three seconds, the authors found that with a water containing a considerable number of bacteria complete sterility was not attained in any case, though the number of organisms present was greatly reduced. Thus, dealing with *B. coli*, the bacterial content of the raw water, which was between 70,000 and 80,000 per cubic centimetre, was reduced to 40 on an average of six observations. *B. prodigiosus* was reduced from 170,000 to 7. Spore-forming micro-organisms fell from 3,000 per cubic centimetre to 2.

With the longer exposure of six seconds (60 litres per hour delivery) the effect was greater. With 50,000 *B. coli* present per cubic centimetre sterility in 200 c.c. was produced on two occasions out of six, in 10 c.c. on four occasions. Similar effects were noted with *prodigiosus* when present in somewhat larger numbers, 65,000 per cubic centimetre. Sporebearers (3,000 in the raw water) were absent from 1 c.c. of the treated water on six occasions, from 10 c.c. and 200 c.c. on three out of six.[1]

Another series of experiments was made in which only moderate amounts of bacteria were present, 3,000 to 4,000. With a three-second exposure *B. coli* were absent in 1 c.c. on four occasions out of six; in 10 c.c. and 200 c.c. on two occasions. As before, *prodigiosus* showed itself more sensitive, none being found in any observation with 1 c.c. or 10 c.c., and being present only three times out of six in 200 c.c. Not much improvement was noted when the exposure was lengthened to six seconds.

Dealing with a very slightly polluted water, such as the ordinary tap water of Hamburg, which contains only six to eight micro-organisms per cubic centimetre, good results were obtained even with only one-and-a-half seconds exposure and a delivery of 240 litres per hour.

Water to which sewage had been added in the proportion of 200 c.c. to 200 litres, and which had then been strained through filter-paper, showed an average reduction of from 1,350 micro-organisms per cubic centimetre to 1·6.

The authors submit the following conclusions, which they are careful to safeguard by saying that they must be held to apply only to water of a chemical nature similar to that of Hamburg, and to the particular pattern of lamp experimented with on this occasion. With a water containing many micro-organisms ultra-violet rays produce a great reduction of bacteria in a very few seconds. With a longer exposure, depending on the number, nature, and specific resisting powers of the organism present, sterility can in many cases be assured. The system, cannot, however, be recognized in its present state as a substitute for the more common methods of water sterilization in use in hospitals and other

[1] In all these experiments six observations are recorded with each germ.

institutions. It is neither simple nor absolutely certain, and the necessity for previous filtration will stand in the way of its installation for even small supply systems. The number of organisms present is of great importance. It should preferably be somewhere between 500 and 2,000 per cubic centimetre. The authors refer to Deeleman's portable sterilizer for field service, and are apparently optimistic as to the future of the ultra-violet rays for use in this direction. They object very strongly to the use of Berkefeld candles for filtration and recommend the Sucro filter.

The second series of observations was carried out with the Westinghouse-Cooper-Hewitt lamp. The apparatus used was similar to that described in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xvi, 1911, p. 170. The current required is one of 3½ to 4 amperes at 110 volts, and the resistance should be so adjusted as to give a tension of 75 volts across the arc after the lamp has been running for twenty minutes. Too high a tension injures the lamp, whilst too low a tension (according to the authors, 59 to 60 volts) seriously interferes with the sterilizing powers of the lamp. The advertisement claimed for the lamp that "no pathogenic germs are present in the water after two minutes' treatment. For complete sterilization, however, ten to twenty minutes must be allowed to lapse, since it is not till the close of this interval that the lamp attains its full powers." The authors state that the claim to possess a selective influence on pathogenic germs has not in their opinion been maintained; on the contrary, they found that the common water bacteria succumbed earlier than those selected as test objects, the individual resisting power of the species being of considerable importance.

After each period of use the apparatus must be completely emptied, and the authors recommend that it should be thoroughly cleaned by means of a reversed flow and thorough brushing. Previous clarification of the water is indispensable. They consider that this would render the use of the "rays" difficult on service.

Experiments were first made to ascertain the length of exposure to which the water was subjected when the delivery was 600 litres per hour, the advertised output. This was ascertained to be fifteen seconds, during part of which the water was partly shaded by the cone-shaped diaphragm. The first exposure, during the period in which the water flows over the first diaphragm lasts only five seconds, and the authors consider, in opposition to v. Recklinghausen, that this is not sufficient for sterilization. Using ordinary tap water with 300 micro-organisms per cubic centimetre, these were reduced after five seconds to 3 in 1 c.c. and 12 in 2 c.c.; *B. prodigiosus* from 50 to 1 and 3; *B. violaceus* from 100 to 5 and 8; *B. coli* from 1,000 to 30 and 50, respectively. Using the longer exposure, fifteen seconds, complete sterility was attained even when large quantities, 10 and 200 c.c. were tested.

Dealing with a clear tap water, bacterial content 300 per cubic centimetre as above, and using the longer exposure, fifteen seconds, sterility was produced in 1 c.c. and 10 c.c., after the lamp had been working for five minutes, but in 200 c.c. not until ten minutes had elapsed.

The next point which was attacked was the number of bacteria which fixed the limit of efficiency of the lamp. The test organisms used were *B. prodigiosus*, *B. coli*, and the *Leucht vibrio*. *B. prodigiosus*

was present in large numbers, 250,000 per cubic centimetre. With an exposure of fifteen seconds, this number was reduced to 12 per cubic centimetre in five minutes, whilst repeated observations at five-minute intervals up to forty minutes gave an average of 15 per cubic centimetre. *B. coli*, 50,000 per cubic centimetre, was reduced to 4 in five minutes, and the average up to forty minutes was 5 per cubic centimetre. A somewhat better result was obtained with this organism when only 5,000 per cubic centimetre were present, but absolute sterility did not result even in one hour. The vibrio was reduced from 5,000 to 15 in five minutes, and the average up to forty minutes was 3. From counts made in two cases at the end of two and four minutes, it was clear that a satisfactory result cannot be expected till the lamp has been working for at least five minutes. In no case with any of the test organisms was sterility produced, and the authors conclude that, dealing with water containing more than 5,000 bacteria per cubic centimetre, it is out of the question to expect to produce complete sterility by exposure to the ultra-violet rays, without some preliminary treatment. Further experiments with the same organisms showed the limit of efficiency to lie somewhere about 2,000 per cubic centimetre.

Thus with 1,500 *B. coli* per cubic centimetre, sterility was produced in 10 c.c. and 200 c.c. in eight minutes, but not in six, the exposure being as before, fifteen seconds. The same result was given with the other organisms experimented on when present in less quantities. (It would appear fairly certain that the current must be allowed to run for some minutes before the best result can be obtained. At the same time the reduction in *B. coli* was marked even in four minutes, only 8 being found in 1 c.c. out of 1,500 originally present.)

Experiments with spore-bearers showed results varying, as might be expected, with the resisting powers of the spores. Thus *B. mesentericus* with spores possessing a ten-minute resistance to current steam, was killed by fifteen second exposure after the current had been running for eight minutes and the voltage had reached 62. Spores with a resisting power of half an hour to current steam showed very varying results, whilst those with a resistance equivalent to ninety minutes exposure to current steam were not completely killed off even by thirty seconds exposure to the rays. It is to be noted that the more resistant germs were unaffected until the tension of the current rose to 70 volts.

As regards the cost of sterilization the authors estimate that with a current of 110 volts and 3½ amperes, the price of current being 20 pfg. per kilowatt hour, the cost of sterilizing 600 litres (131·25 gallons) would be 7·7 pfg. This does not include interest on capital cost, or depreciation. They are unable, unfortunately, to give cost of other Hamburg installations for comparison.

They point out that in the particular apparatus with which they carried out these experiments, very careful cleaning with brushes, and also by means of reversed flow was necessary after each observation. The enamelling of the inside of the apparatus seems to have given them some trouble, through scaling off, and thus leading to accumulation of particles from the water.

They also complain of great difficulty met with as regards the current, which showed great alterations in pressure, attributed by them to variations in the internal resistance of the lamp. There appears to have been

some trouble with the lamp going out. They point out that even if automatic inlet valves are fitted, a certain amount of water would still come from the outlet, unsterilized. They estimate this amount at 20 c.c., containing a reduced but still considerable number of organisms. They offer the following conclusions:—

(1) That with the Westinghouse apparatus Type B 2, and dealing with a water containing only a moderate number of organisms, that is under 2,000, it is possible to deliver sterile water which is "bacteriologically free from objection" (*bakteriologisch einwandfrei*) at the rate of 600 litres (132·15 gallons) per hour as long as the lamp works satisfactorily.

(2) The cost of installation and upkeep is such as to render the method not generally applicable.

(3) It is the task of experts to provide a satisfactory lamp. Special regard should be had to ease of cleansing.

(4) It is absolutely necessary that means should be provided by which any flow of unsterilized water, subsequent to any actual extinction of the lamp, should be absolutely prevented.

[One conclusion is clearly to be drawn from these series of observations, and that is, that a great deal of technical improvement in matters of working detail is necessary before the ultra-violet rays can be considered a really practical method for field service. Once these difficulties are overcome, it seems to me that there is a great future for this method of water purification. Even with a high bacterial content the purification effected is very important. A previous process of clarification will, of course, be necessary in grossly polluted waters; but we know that this can easily be effected with our latest cloth clarifiers. It is probable that even with clear streams as those of chalk districts, some straining would be necessary. As the authors remark in a footnote, the bacteria in water do not necessarily exist in the form of isolated individuals but more probably, especially in the case of the motile bacteria, in clumps. I should imagine that this would be apt to be more especially the case with the bacteria of intestinal disease, which must frequently be enclosed in small masses of mucus or fæces or other organic matter. Such aggregations are probably removed by even comparatively coarse filtration. When a comparative count is made of the bacteria present in the water before and after such filtration, these small masses count merely for one colony each in the raw water, and the actual purification effected, that is the percentage of the total bacterial content that is removed, is in reality considerably underestimated. The ultra-violet rays probably act with difficulty on any but the superficial members of these aggregations, whilst they attack efficaciously the isolated germs or smaller masses that escape filtration. It must be remembered that the expression "a bacteriologically unobjectionable water" possesses a different meaning for the sanitary officer to that which it possesses for the surgeon. The former only desires the removal of a few specified non-sporing germs, the latter complete sterility.] C. H. M.

Army Water Purification (Extract from the *Army and Navy Register*, October 28, 1911, Washington, D.C.).—The Army medical officers in the Philippines are engaged in some important investigations into new methods of purifying water for troops in the field. A report of some recent work in that direction has been received by the Surgeon-

General of the Army from Major W. P. Chamberlain and Captain E. B. Vedder, of the Army Medical Corps. . . .

The apparatus, with dynamo and gasoline engine, may be readily carried in the escort wagon or automobile, in which latter case the motor of the vehicle could be utilized to drive the dynamo. The smaller apparatus is capable of supplying an entire regiment with a quart of water for each man after three hours' operation. The larger apparatus is capable of providing in twelve hours, 3 gallons of sterilized water for every soldier in a division of 20,000 men. It is important before adopting any method of water purification for tropical countries to show that the procedure will protect the consumers against infection with animal parasites as well as against bacterial causes of disease. The experiments conducted by the medical officers in the Philippines were considered as demonstrating that the method accomplished this result.

Extract from the Annual Report of the Surgeon-General of the Army for the Year ending June 30, 1911 (*Army and Navy Register*, Washington, D.C., November 4, 1911).

"*Health of the Army.*—The mean strength of officers was 4,216, as obtained from the reports of the sick and wounded of the medical department, and 4,416 from the office of the Adjutant-General.

"There were 2,515 admissions, 15 deaths, and 119·54 constantly non-effective from all causes, equal to ratios of 596·54, 3·40, and 28·35.

"*Enlisted Men.*—The mean enlisted strength of the army, American troops, white and coloured, for the year 1910, as reported on the monthly sick reports of the medical department, was 71,534.

"The constantly non-effective rate, which is the true measure of the loss in efficiency of the army from sickness and injury, was 35·93 per 1,000, as compared with 41·48 for 1909, 42·68 for 1908, 46·17 for 1907, and 49·79 for 1906.

"The total number of admissions to sick report was 67,940, equal to an admission rate of 949·76, as compared with 1,062·99 for the previous year, and 1,188·03 for 1908.

"The deaths from all causes numbered 320, of which 175 were from disease.

"The discharges for disability numbered 1,007, the rate being 14·02, as compared with 16·84 for 1909, 18·48 for 1908, and 20·15 for 1907.

"*Non-effective Rates for Disease.*—The progressive improvement since 1898 has been due chiefly to sanitary control of the infectious fevers—malarial, typhoid, and yellow fever. It would be even greater than at present if it had not been offset to a considerable extent by the formidable increase in the venereal diseases and tuberculosis.

"There were 25,133 recruits examined as compared with 23,520 for the preceding year. Of each 1,000 examined 94·62 were rejected and 16·19 declined enlistment, as compared with 142·69 and 24·62 for 1909. Of each 1,000 examined by medical officers, 889·19 were accepted, as compared with 832·69 for 1909. Of the number enlisted 492·54 per 1,000 were re-enlistments, and 396·65 were original enlistments, as compared with 363·65 and 469·04 for 1909.

"The average weight of white recruits was 144·5 lb.; of coloured recruits, 150·44 lb.

"The chest measurement of 47·15 per cent of the white recruits was

34 in. and over; and 2·87 per cent were 30 in. and under, as compared with 47·77 and 2·54 per cent respectively for the preceding year.

"Heart disease caused the largest proportion of rejection, being 116·48 per 1,000, as compared with 104·18 for 1909. Venereal diseases were second, with diseases of the eye, ear, organs of locomotion, in the order given.

"*Vaccination against Typhoid.*—During the calendar year of 1910, 16,093 persons were protected against typhoid fever by means of prophylactic vaccination. Of these 73 per cent received three doses, 21 per cent two doses, and 5·7 per cent one dose. During the first six months of 1911, 27,720 persons were immunized; of these 93 per cent received three doses, 6 per cent two doses, and 1 per cent one dose.

"It is worthy of remark that compulsory vaccination against typhoid had never been attempted in any military service until used in our army in Texas, and along the Mexican border in the spring of 1911. In this region troops to the number of about 15,000 have been immunized while under canvas, and engaged in the multitudinous activities of manœuvres without interference with their duties and without any bad results. The almost complete absence of typhoid fever (only two cases with no fatalities being reported in this large number of men after a period of four months in the field) justifies the position that has repeatedly been taken with reference to immunizations against typhoid.

"*Alcoholism in the United States.*—The admission-rate for alcoholism for the United States for the year 1910 was 23·51 per 1,000, which is an improvement over the preceding year, when it was 25 per 1,000. It is gratifying to observe that this rate has shown a steady diminution for the last four years, following an equally steady rise for the eight years prior to 1907. This rise was synchronous with the enormous increase in the venereal rate, beginning also in 1899, and it is difficult to escape the conclusion that there has been some connexion between the two.

"It is of interest to observe the alcoholic rates for the last thirty-one years, dividing this time into three periods of a decade each: (*a*) Prior to the establishment of the canteen in 1890; (*b*) the period of eleven years covering the time when the sale of beer was permitted; and (*c*) the decade since the prohibition of such sales at the beginning of 1901. (In the consideration of this period of thirty-one years the tropical possessions of the United States have been excluded, because the conditions in them are special, and prevent a fair comparison with the statistics before the acquisition of foreign territory by this government). The average admission-rate for the decade preceding the canteen was 55 per 1,000; for the canteen period it was 26 per 1,000, and for the decade since the abolition of the canteen, 28 per 1,000. A study of the rates show a steady fall from 1882 and 1883, when it was 69 per 1,000, down to include 1898, when it reached its lowest point, 16 per 1,000. This was followed by a rise covering eight years, followed by a fall. It will be observed that the improvement in the alcoholic rate began before the establishment of the canteen, and was continued during most of the canteen period. It is believed that this corresponds to the general progress of temperance in the United States, and that it would have been sustained but for the undoubtedly injurious effect of the abolition of the canteen, which destroyed the attractiveness of the soldier's club, and compelled him to go outside of the limits of the military post for amusement. In this way

he is tempted to drink distilled liquors to excess in place of mild fermented liquors in moderation.

"*Hospital Corps.*—In my opinion there is urgent need for the re-adjustment of the rank of the non-commissioned officers and for an increase in pay for both the non-commissioned officers and privates of the hospital corps. There is no question but that service in the hospital corps is not as attractive since the Pay Bill of 1908 as it was before. This Bill made service for the enlisted men in the line and other staff departments much more attractive than it had been previously, while it did not increase the pay of the privates, first class, and privates of the hospital corps and gave only a small increase for non-commissioned officers as compared with other non-commissioned officers of the army.

"I therefore recommend that the number of men allowed the hospital corps be increased to 4,000; that action be taken to increase the pay of the members of the hospital corps; and that the organization be as follows: Serjeant-majors, 30, at 75 dollars per month; serjeants, first class, 250, at 65 dollars per month; serjeants, 400, at 36 dollars per month; corporals, 120, at 24 dollars per month; privates, first class, 2,400, at 21 dollars per month; and privates, 800, at 16 dollars per month."

TABLE SHOWING COMPARATIVE STATISTICS OF BRITISH AND AMERICAN ARMY AT HOME AND ABROAD.

Ratios per 1,000	American. Home and abroad. 1.7.10 to 30.6.11	British. Home and abroad. 1.1.10 to 31.12.10
Admissions	949·76	443·1 *
Deaths	4·47	3·44
Invalids discharged	14·02	9·11
Average con. sick	35·93	25·38
Admissions for alcoholism	23·51	·7

* 837·5 including barrack treatment.

C. E. P.

Motor Transport for the Medical Services in War. Med. Major Duguet (*La France Militaire*, March 19, 1911).—Duguet calculates that at the end of an engagement an infantry division would have roughly 4,000 men wounded. Of these 800 could march, 1,000 would not be fit for transport, 1,400 would require sitting-up carriage and 800 would require to be carried lying-down. In order to remove the 1,400 sitting-up cases 116 horsed wagons moving at 3 kilometres an hour would be required and the journey would take seven hours to reach a stationary hospital 12½ miles distant. The 1,400 wounded could be removed to the same destination in eight hours by employing twenty-four motor wagons. Motor transport is five times as efficient as horse transport; thirty-eight motor wagons permit of a saving of 200 drivers and 400 horses. Medical units supplied with motor transport can be rapidly pushed up to the front when required.

A motor ambulance column should not consist of more than fifteen wagons and must observe strict march discipline. The officer in command should have a motor bicycle or motor car. C. E. P.

Improvements in the Arrangements for the Care of Mental Patients in War. Stabsarzt Dr. Stier (*Deut. Militärärzt. Zeitschr.*, June 5, 1911).—As a result of the experience gained in the Russo-Japanese war the German army medical authorities have made the following arrangements for dealing with insane patients in war time:—

Drugs.—The advanced depots of medical stores will keep supplies of the following drugs for use in maniacal cases: Prepared injections of hyoscine; each injection will contain hyoscine, scopolamine, hydrobromic acid, and chloride of morphia, and will be put up in a separate sealed tube; large quantities of veronal and trional will be kept ready for issue to convoys of insane patients before commencing the journey by train. The advanced depots will also hold a supply of articles required to equip hospitals for the insane. In order to provide the necessary personnel a certain proportion of that allotted to clearing hospitals will be specially trained in the care of mental cases, while additional personnel will, if necessary, be obtained from civil asylums. The question of adapting railway carriages for the transport of insanes has not been taken up as yet. A special return showing the accommodation available for insanes in the general hospitals in the home territory will be rendered regularly to the Senior Railway Staff Officer who will pass this information to the sick transport detachments. The Senior Medical Officer will also receive similar information from the medical department of the War Office.

The voluntary aid societies might with great advantage to the army medical department provide personnel specially trained in the care of insanes for escort duties on the homeward journey. C. E. P.

Wind Instruments and Longevity. (Extract from *Lancet*, April 29, 1911).—Without any definite grounds pathologists have ascribed to the blowing of wind instruments injurious effects on the heart and lungs. In the *Yale Medical Journal* for February, Dr. James F. Rogers states that he investigated the subject a few years ago and found that this teaching is not correct, and that there is no evidence that emphysema of the lungs is produced, or that there is any increased proclivity to tuberculosis or other pulmonary affections among performers on wind instruments. He also could find no evidence of any bad effect on the heart. Since the publication of these facts Dr. Forcheimer, in his "Prophylaxis and Treatment of Internal Diseases," has stated that "just as many players of stringed instruments have emphysema as players of wind instruments," and after a long experience of musicians he has come to the conclusion that "neither emphysema nor its predisposition is a result of their occupation." To determine statistically the effects on longevity of playing upon wind instruments Dr. Rogers consulted Grove's "Dictionary of Music and Musicians," and Champlin's "Cyclopædia of Music and Musicians," and calculated the average age of 100 performers upon wind instruments and of a like number upon stringed instruments. The average length of life of players upon wind instruments was 63·5 years and of players upon stringed instruments 62 years. Of the former, 34 per cent reached ages above 70 years. For the different wind instruments the average ages were as follows: Flute, 61·2 years; oboe, 63 years; bassoon, 63 years; horn, 64·4 years; clarionet, 65·2 years; trumpet and cornet, 69·1 years. It is interesting that the players on wind instruments who exert the greatest intrapneumonic pressure, namely, performers on

the trumpet and cornet, were the longest lived, while the players who exert the least pressure, the flautists, were the shortest. Dr. Rogers does not attribute the greater longevity of the former to the higher pressure, but to the facts that the more vigorous would be apt to take an instrument requiring much effort, and that only such as could make a mark as virtuosi would secure a paragraph in an encyclopædia. A consumptive, like Sidney Lanier, might be a brilliant flautist, but no consumptive could make a fine clarionetist or trumpeter. These figures therefore refute the current teaching that playing upon wind instruments tends to shorten longevity. It appears to have been assumed that the high intrapneumonic pressure during the blowing, which may exceed 100 mg. of mercury, would tend to cause emphysema. But the fact is overlooked that this pressure is counterbalanced by the pressure of the chest walls on the lungs.

Voluntary Aid Detachments of the German Red Cross Societies (*Das Deutsche Rote Kreuz, Entstehung*, &c., vol. i, p. 275, Berlin, 1910). On August 31, 1909, the total number of Voluntary Aid Detachments and their personnel in the German Empire was as follows:—

	Number of Detachments	Total number of members of all kinds	Number of Trained Personnel available for Duty on Mobilization: For sick transport duties		For nursing duties	
			For L. of C.	For Home Territory	For L. of C.	For Home Territory
I. Voluntary Aid Detachments of the Red Cross Society	1,676	52,382	13,080	13,893	1,313	750
II. Voluntary Aid Detachments of the Society for providing male nurses for war	66	8,596	..	..	1,456	847
III. Samaritan Branch of the Red Cross Society	11	1,369	..	..	112	251 men 250 women 194 asstnt. nurses
IV. Professional male nurses and pensioners of the Medical Corps, not belonging to any Detachment	..	1,557	..	..	511	824
Grand total	1,753	63,904	13,080	13,893	3,392	3,116

C. E. P.

Napoleon's Maladies.—Dr. Bonnette (*Bulletin du Service de Santé Militaire*, October 1911) gives a sketch of the principal diseases from which Napoleon suffered at different periods of his career.

At the siege of Toulon, Napoleon contracted itch from a gunner; he never quite recovered from the effects of this, as it left a recurring eczema. During the earlier period of his consulate he was greatly troubled by his gouty diathesis. About this time he began to suffer from a persistent cough and difficulty in breathing. He became

emaciated, pale and depressed, so much so that a fatal termination seemed probable. For a long time he refused to have any medical advice, but finally he consented to see Desgenettes who apparently employed his best bedside manner, as Napoleon, after the interview, summed him up as a babbler and his art as an imposture. The advice given was not followed.

Napoleon's condition became steadily worse, and he was finally persuaded to allow Corvisart to examine him. Corvisart's diagnosis was "an itch driven inwards, loss of flesh and pulmonary disorders." Corvisart, more shrewd than Desgenettes, told Napoleon that his trouble was not serious, "merely a humour which had been driven inwards and which must be fetched out again." He accordingly applied blisters to Napoleon's chest; the treatment was followed by a rapid improvement, and Napoleon showed his gratitude by bestowing substantial benefits on the fortunate physician.

When a post-mortem examination was made at Longwood, the upper lobe of the left lung was found to contain numerous tuberculous nodules and a few old cavities; the lung was also adherent to the chest wall and pericardium.

During his numerous campaigns Napoleon enjoyed excellent health. Whenever he felt out of sorts he took a very hot bath to induce free perspiration.

When about 40 Napoleon became stout and his mind somewhat lethargic; he failed to grasp situations or make his resolutions as rapidly as formerly, and even fell asleep when studying maps. At this time he became increasingly subject to attacks of acute dysuria. After death the bladder was found to be contracted and to contain a quantity of gravel and some fine calculi.

Napoleon was a very rapid eater, rarely allowing more than fifteen minutes for any meal. In later life he suffered from severe digestive troubles.

In 1819, at St. Helena, Napoleon suffered from a painful congestion of the liver, for which a naval surgeon recommended a change of climate.

At the autopsy Antommarchi found a scirrhous cancer near the pylorus which was adherent to the left lobe of the liver.

C. E. P.

Correspondence.

THE TRANSPORT OF WOUNDED.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In the new (1911) "Royal Army Medical Corps Training," just issued, bearers are still taught, as in the old editions, that when they find a patient with a tranverse or punctured wound of the abdomen they are to "lay him on his back with his legs drawn up. . . . a pad or other article being placed under his hams to keep his knees bent" (p. 147 in 1911 and p. 48 in 1908 editions).

Surely one of the most important lessons which we learnt in the South African War was that a patient suffering from any wound of the abdomen

should be kept absolutely still and should have neither food nor water given to him; would it not be sounder to teach Royal Army Medical Corps privates that they must not allow a man with a wound of the abdomen to be moved at all, except in the utmost emergency, without the sanction of a Medical Officer, and that these are the cases, above all others, in which a temporary shelter should be thrown up, the patient left where he is and not allowed even a drink until a Medical Officer can be summoned to see him?

Even the amount of movement necessary to put on a first field dressing might be sufficient to determine a fatal result in an abdominal wound.

I am, &c.,
H. S. Roch,
Major, R.A.M.C.

York,
November 11, 1911.

PROPOSAL FOR ARMING MEDICAL UNITS, WITH SPECIAL REFERENCE TO THE ROYAL ARMY MEDICAL CORPS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—Lately letters have appeared in the Journal raising the question whether Territorial medical units should be armed, but no mention has been made of the rank and file of the Regular Medical Service, who have been without weapons since the side-arm was abolished some years ago.

Many officers of the Corps to whom I have spoken on the subject appear to be unaware that the Geneva Convention expressly states, that the fact of a medical unit bearing arms for defensive purposes shall not thereby forfeit its claim to protection under the Convention.

No one doubts that the Corps should be armed in savage warfare. In the last Soudan War isolated detachments of the Medical Corps engaged in collecting wounded were several times in jeopardy from bands of the enemy making an unexpected attack, and were only rescued in the nick of time. My informant is an N.C.O. of the Corps, who was himself severely wounded on one of the occasions referred to.

It is customary in savage warfare to provide an infantry guard for medical units in our service; if the men themselves were armed, this would not be necessary in the case of the Royal Army Medical Corps [in India, where the rank and file of a medical unit are recruited from the riff-raff of the bazaars, the matter is different]—and a number of infantry-men would be free to do their own work—fighting. Even in civilized warfare the special work of the Royal Army Medical Corps often places them and the wounded under their charge in danger of attack from marauders and pillagers. This might easily happen when collecting wounded after dark, or going out in detached parties in a hostile country.

On strike duty a party of roughs might easily avenge themselves on the defenceless men of the Corps if isolated, whereas the sight of a side-arm would in most cases act as a deterrent. The medical units of all the Continental powers are armed. In the German Army a formidable sword-bayonet, having a blade two feet long, is carried by the rank and file, and the senior N.C.O.s are equipped with an automatic pistol.

The French, Austrian, and Russian medical personnel all carry side-arms, and the Italians equip their medical rank and file with a carbine and bayonet, which they have been called upon to use on several occasions in the recent fighting in Tripoli.

In the last Ashanti War the men of the late Army Hospital Corps were all armed with a carbine and bayonet.

A step has been made in the right direction by re-introducing the musketry course at our Depot, though no provision has been made for the men to keep themselves proficient in this branch. The vast majority of our rank and file have not done this course, and are absolutely ignorant of firearms. I have known many who did not even know how to take the bolt out of the short L. E. rifle or to empty the magazine!

Apart from the above considerations, the possession of a weapon of some sort in a military unit, even though it is non-combatant, has many advantages. It improves the man's turn-out, makes him remember that he is a soldier (an important point in many ways), and generally fosters *esprit de corps* and smartness, and improves "morale."

The improvement in the bearing of recruits at our depot once they have got a rifle in their hands is very marked; they become smarter and keener, and *their other work improves*; to use an Hindustani expression, their "izzat" is higher, and they take more pride in themselves.

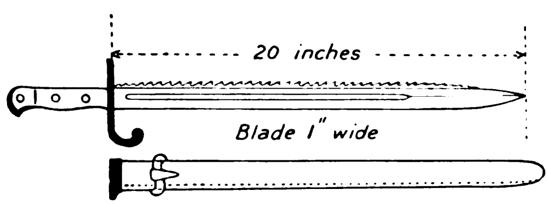
Supposing it taken for granted that an arm of some sort is desirable, the question arises, what sort of weapon would be suitable. A recent article in the JOURNAL mentions revolvers in connection with Territorial medical units, but from what I have seen of this weapon in the hands of partially-trained men, I am inclined to think that the medical personnel and the wounded under their charge might have another danger added to the many they are now called upon to face. (I allude, of course, to its possession by the rank and file, whom it would be difficult to train adequately in its use).

In savage warfare a firearm, having a longer range than a pistol, and safer to handle, is essential; it need not have the range of the infantry rifle, and in my opinion the short L. E. is unnecessarily heavy and cumbersome for a medical unit—some light weapon that could be slung out of the way so as to leave both hands free is required. I suggest that the obsolete Lee-Metford cavalry carbine, of which there must be thousands in store, would, with a few modifications, meet all requirements. It takes the ordinary ·303 ammunition, is light and easy to handle and carry, and would be quite powerful enough for the work required of it,

being effective up to 800 yards or so. At a small cost it could be converted to clip-loading and re-sighted, and the fore end fitted to take a bayonet, as has been done with the long Lee-Enfield at present used by the infantry of the Territorial Force; with a leather sling fastened to the left side of the rifle, it could be comfortably carried slung on the back.

In civilized warfare a firearm would not be necessary for all. Officers and senior N.C.O.s would carry a revolver or automatic pistol, and the remainder should carry a side-arm, more, perhaps, as a moral force to deter interference than for practical use as a weapon. If this side-arm could at the same time be made useful in other ways, its value would be enhanced.

I suggest the following machéte, made bayonet fashion, so that it could be fixed to the carbine for use in savage warfare. The general design is that of the new-pattern bayonet, with which the hilt is identical, though stronger, but the blade is longer and heavier, with a sharp edge and a saw back, so that it could be used for various purposes—as a saw, a bill-hook, or for chopping wood or cutting up rations. A pad could be provided for putting over the edge of the machéte when using it as a saw, if necessary.



It would be issued to all the rank and file and N.C.O.s up to the rank of serjeant, the present long sword being retained by warrant officers and staff sergeants for use on ceremonial occasions, but replaced by a pistol on active service.

The side-arm would be worn at all drills and manœuvres and on active service, and the old ceremonial sword exercise might be re-introduced. It took a very short time to learn, and greatly enhanced the effect of a "general inspection."

Officers, warrant officers, and N.C.O.s, armed with the pistol, should be put through an annual course of twenty-four rounds (at least), which could easily be carried out at any military station.

I am, &c.,
KEPPEL H. REED,
Capt. R.A.M.C.

Aldershot,
November 26, 1911.

No. 3. March, 1912. Vol. XVIII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL W. H. HORROCKS,

ROYAL ARMY MEDICAL CORPS

ASSISTED BY

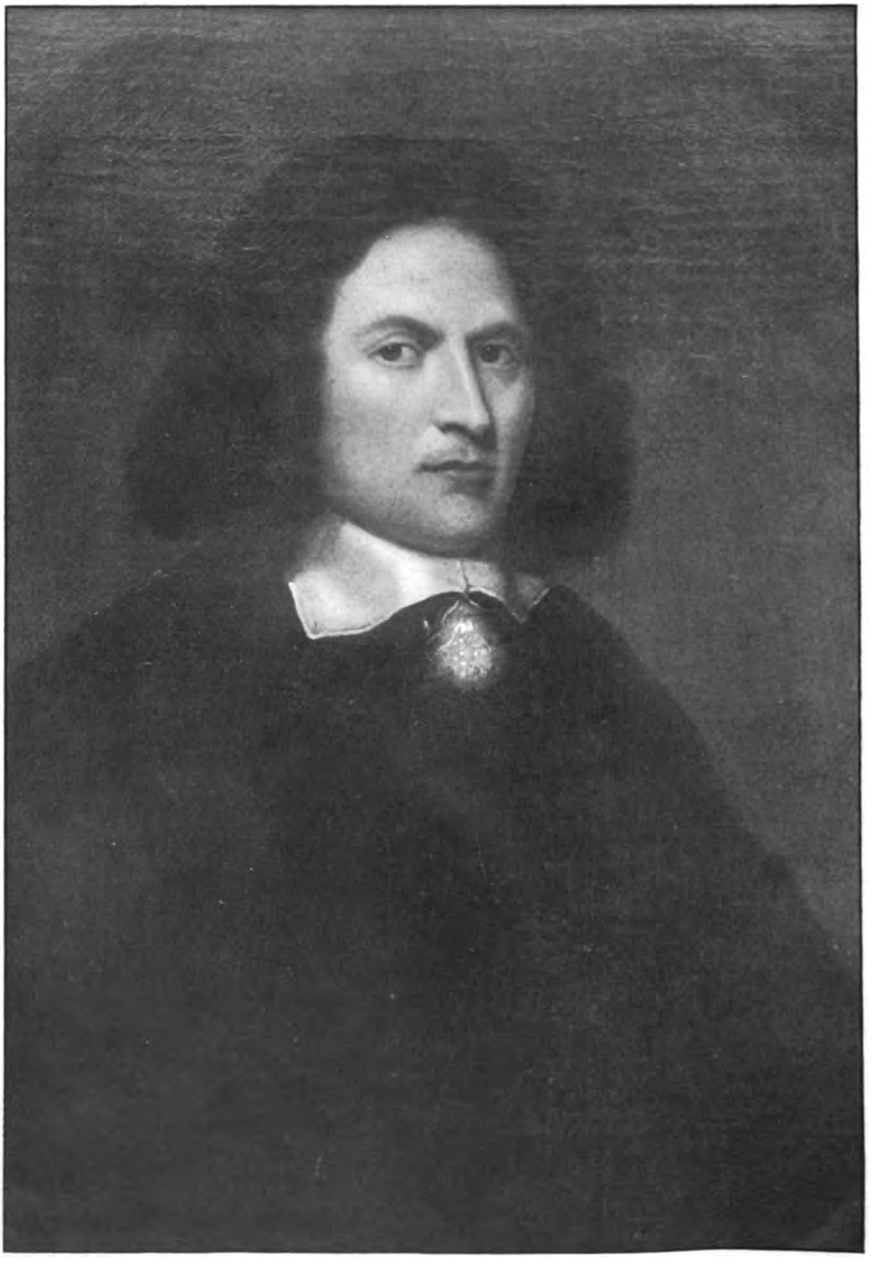
MAJOR C. E. POLLOCK,

ROYAL ARMY MEDICAL CORPS

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
OXFORD HOUSE,
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W

Price Two Shillings net.



VOLUME XVIII. MARCH, 1912. No. 3.

Journal

of the

Royal Army Medical Corps.

Original Communications.

RICHARD WISEMAN, SERJEANT-SURGEON TO CHARLES II.

By Major H. A. L. HOWELL.
Royal Army Medical Corps.

In the following memoir the writer hopes to excite the interest of his brother officers in the life and work of one of the greatest of the English surgeons of his time, a Royalist Army Surgeon.

There is some uncertainty as to the parentage of Wiseman. After much research Sir Thomas Longmore concluded that he had sprung from some citizen family of London. Some authorities, however, think it probable that he was an illegitimate son of Sir Richard Wiseman, of Thundersley Hall, Essex.

Certain it is that Sir Robert Wiseman, a member of the same Essex family, acknowledged "Richard Wiseman, Esq., one of His Majesty's Chirurgeons-in-Ordinary" to be his kinsman and a descendant of his family, and granted him permission to use and bear the coat-of-arms and crest of his family. The College of Arms does not, however, consider this any proof of relationship.

There is some evidence to support the opinion that Wiseman was nephew to Mr. Edward Edgeman, Secretary to Lord Clarendon, Lord High Chancellor and Chancellor of the Exchequer under Charles the Second.

The date and place of Wiseman's birth is unknown. He was probably born between the years 1621 and 1623.

Wiseman was apprenticed to Richard Smith, Surgeon, some time in the year 1637; for, in that year, his master paid the usual fee of half-a-crown to the Barber-Surgeons' Company on his being

bound as an apprentice. At that time the term of apprenticeship was seven years and the apprentice was usually bound at the age of 14 or 15 years. A barber-surgeon could not practice until he was free and no surgeon's apprentice could get his freedom before the age of 21.

It was not at all uncommon at this period for military officers and surgeons to serve at one time in the Navy and at another in the Army. In time of peace many sought experience of war in the armies and navies of friendly nations. At this time there was no standing army in England; troops being raised only when they were required for active service in the field and afterwards disbanded. Military knowledge could therefore only be continuously pursued in the service of foreign Powers.

There appears to be little doubt that the earlier years of Wiseman's practice as a surgeon and perhaps his apprenticeship (for it has been suggested that Richard Smith was a Naval Surgeon) were spent on board the ships of the Dutch Royal Navy. All the cases of wounds and injuries described by Wiseman in his treatises as having occurred before he served in the Army were treated on board ship. We can also gather from the same source that his service as a Dutch Naval Surgeon was of long duration, and that he had during that time been in many naval engagements.

It was, however, as a Royalist Army Surgeon that Wiseman gained his fame. On the outbreak of the Great Civil War in England most of the Englishmen who were in the service of foreign Powers returned to England and took up arms on one side or the other.

Wiseman makes no reference in his writings to any of those wounded in the earlier battles of the war. He does not appear to have joined the Royal Army until the end of the year 1643. In 1644 he was on active service in the field with the Royalist forces in Dorset, Somerset, Devon and Cornwall. At this time the Prince of Wales was in chief command of the Royal Army in this part of England.

Wiseman was at the surprise of the forts at Weymouth on February 9, 1644-45, and was amongst those besieged in that town. He narrowly escaped capture when the town was taken by the Parliamentarians under Colonel Sydenham, brother to Sydenham the physician. He was probably Surgeon to Colonel Ballard's regiment, for all the wounds he describes at this time were in men belonging to this Corps. He was with Goring in the attack on Melcombe Regis and then went to the West of

England and took part in the siege of Taunton and the fighting at Truro. Some idea of his experiences during this part of his life may be gathered from a few excerpts from his treatises.

"At the Siege of Melcomb Regis, a Foot-souldier of Lieutenant Colonell Ballard's, by the grazing of a Cannon-shot, had a great part of his Forehead carried off, and the Skull fractured into many pieces, and some of it driven with the Hairy scalp into the Brain. The man fell down as dead, but after a while moved; and an hour or two after, his Fellow-souldiers seeing him endeavour to rise, fetcht me to him. I pulled out the pieces of Bones and lacerated Flesh from amongst the Brain, in which they were intangled, and drest him up with soft folded Linen dipped in a Cephalick Balsam, and with Emplaster and Bandage bound him up, supposing I should never dress him any more. Yet he lived 17 days; and the 15 day walkt from that great Corner-fort over against Portland to the Bridge which separates Weymouth from Melcomb Regis, onely led by the hand by some one of his Fellow-souldiers. The second day after he fell into a *Spasmus*, and died, howling like a Dog; as most of those do who have been so wounded."

"At the siege of Weymouth I was called at break of day to an Irish-man of Lieutenant-Col. Ballard's Regiment, who shooting off his Musket, it broke, and tore his Hand to pieces after a strange manner. I, designing to cut off his Hand, sent presently to my Quarters to one of my Servants to bring both Saw and Knife, also Dressings, of which at those times we had always ready. They being brought, I took a red Ribbon from off my Case of Lancets, and bound it about his Arm some four fingers' breadth above the *Carpus;* and having cut the Flesh round off, I bared the Bones and separated the flesh between them. Then I sawed off the Bones, and untied my Ligature, and bringing down the musculous Flesh and Skin over the end of them, without making any crosse Stitch, I drew up that Stump with Restrictives and good Bandage, and returned again to my Quarters. I had not been one hour gone, before I was again sent for to this Souldier, he being (as the Messenger said) grievously pained. I wondred at it, and hastned away: but before I came to his Hut, I heard him crying. I enquiring the cause, it was some while before he would answer me. But at last he told me, he was unable to endure that red Ribbon that I tied his Arm with. I was at first surprized to think I should leave the Ligature upon his Arm, that being a sure way to bring a Mortification upon the Part. I therefore put my Hand in my Pocket, and feeling the Ribbon on the case of Lancets, showed it to him. He seemed at first to doubt it,

but after he saw it was so, he laught, and was from that time in ease. Two days after, our men were surprized and chased out of the Town and Chappell-fort, I was at the same time dressing the wounded men in the Town almost under the Chappell-fort, and hearing a woman cry *Fly! Fly!* the Fort is taken, I turned aside a little amazed toward the Line, not knowing what had been done; but getting up the Works, I saw our people running away, and those of the Fort shooting at them. I slipt down this Work into the Ditch, and got out of the Trench; and as I began to run, hearing one call Chirurgeon, I turned back, and seeing a man holding up a stumped Arm, I thought it was the *Irish-man* whom I had so lately dismembred: whereupon I returned and helpt him up. We ran together, it being within half a Musket-shot of the Enemies' Fort; he out-ran me quite. I afterwards cured him in a few weeks."

Here is Wiseman's account of one of his cases at Taunton. "At the Siege of Taunton one of Colonell Arundell's men, in storming the Works, was shot in the Face by Case-shot. He fell down, and in the Retreat was carried off among the dead, and laid into an empty house by the way, untill the next day; when in the morning early, the Colonell marching by that house heard a knocking within against the Door. Some of the Officers desiring to know what it was lookt in, and saw this man standing by the Door without Eye, Face, Nose or Mouth. The Col. sent to me (my Quarters being nearest) to dresse the man. I went, but was somewhat troubled where to begin. The Door consisted of two Hatches; the uppermost was open, and the man stood leaning upon the other part of the Door which was shut. His Face, with his Eyes, Nose, Mouth, and forepart of the Jaws, with the Chin, was shot away, and the remaining parts of them driven in. One part of the Jaw hung down by his Throat, and the other part pasht into it. I saw the Brain working out underneath the lacerated Scalp on both sides between his Ears and Brows. I could not see any advantage he could have by my Dressing. To have cut away the lacerated parts here had been to expose the Brain to the Air. But I helpt him to clear his throat, where was remaining the Root of his Tongue. He seemed to approve of my Endeavours, and implored my Help by the Signs he made with his Hands. I askt him if he would drink, making a sign by the holding up a Finger. He presently did the like, and immediately after held up both his Hands, expressing his Thirst. A Souldier fetcht some Milk, and brought a little wooden Dish to pour some of it down his Throat;

but part of it running on both sides, he reacht out his Hands to take the Dish. They gave it him full of Milk. He held the Root of his Tongue down with the one Hand, and with the other poured it down his Throat (carrying his Head backward) and so got down more than a quart. After that I bound his Wounds up. The dead were removed from thence to their Graves, and fresh Straw was fetcht for him to lie upon, with an old Blanket to cover him. It was in the Summer. There we left that deplorable creature to lodge; and while we continued there, which was about 6 or 7 days, he was drest by some of the Chirurgeons with a Fomentation made of Vulnerary Plants, with a little Brandy-wine in it, and with Stupes of Tow dipt in our common Digestive."

The Royalists had to retreat from Truro and the Prince of Wales sought refuge in the fort of Pendennis Castle, at the entrance into Falmouth harbour. At this time Wiseman appears to have been on duty with the Prince's guards, under the immediate command of Lord Hopton, who took over the chief command of the Royalist Troops after the Prince's departure to Scilly. Wiseman escaped after Lord Hopton's defeat and rejoined the Prince at Scilly. It appears that Richard Pile, one of the King's Serjeant-Surgeons, and Dr. Frazer, one of the King's physicians, were also there.

In April 1646, the Prince escaped to Jersey. Wiseman accompanied him. At Jersey Serjeant-Surgeon Pile left the Prince, and, apparently, Wiseman (who was a favourite of Lord Hopton's, and was perhaps recommended by him) became surgeon to the Prince. He appears to have continued in attendance on the Prince when he went to Paris and afterwards to The Hague. While here the Prince became King on the death of his father. He then went to Breda and to St. Germains. In 1649, he and Frazer were with the King on his second visit to Jersey, and went from that place to Breda. Here preparations were made for the expedition to Scotland.

In June, 1650, Charles II landed in Scotland. Wiseman's writings are full of references to this time. He was present at the fighting at Stirling, the taking of Callendar House, the fight at Musselburgh, and at Dunbar. He was with the Court at Perth, and marched with the King's army from Scotland into England. At the battle of Worcester, which followed, Charles II. was defeated, and Wiseman with many others was taken prisoner. The King, after many vicissitudes, managed to escape into Sussex, and, from thence to the Continent. Frazer, the King's physician, also

escaped capture. Wiseman was marched with other prisoners to Chester. So ended Wiseman's career as an army surgeon.

He appears to have remained at Chester until the end of the year 1651. He was, however, allowed to practice his surgical skill upon the wounded. He describes an amputation of the arm, after a gunshot wound at the elbow, which he performed at this time. At last he obtained a pass to go to London, and arrived there in February, 1652.

Soon after his arrival in London, Wiseman obtained the freedom of the Company of Barber-Surgeons. The date of his admission was March 23, 1651-2. He now, for a time, assisted "that most excellent Chirurgeon, the deceased Mr. Ed. Molins, in dressing his patients." Wiseman's position was a peculiar one. He was still a prisoner but was allowed his liberty under special bail for his appearance if he were required. Wiseman was anxious to be delivered of his bail in order that he might rejoin the King, but, being unsuccessful, he took a house and established himself in practice "in the Old Bayley at the signe of the King's Head." He was soon doing very well at his profession, but this happy state of things only continued for two years.

About a fortnight after the Christmas of 1653 Wiseman was consulted by a Royalist, Mr. James Read, concerning a sore leg, and continued in attendance on him until the leg was nearly well. Read was suddenly arrested and cast into the Tower. After a few days Read sent a warder named Steere to Wiseman asking him to continue his attendances as the leg had become worse. It was only after repeated requests from Read, and with the assurance that the permission of the Lieutenant of the Tower had been obtained that Wiseman agreed to visit his patient again. Read attempted to escape and suspicion fell on Wiseman, who was supposed to have supplied the prisoner with aqua fortis to be used in the attempt. Wiseman and his servant were called to the Tower and interrogated by the Lieutenant, who, apparently satisfied by his examination, allowed Wiseman to return home.

In March, Steere came to Wiseman and said he had promised to assist Read to escape, and asked Wiseman's help. The warder, it afterwards turned out, was acting as a decoy with the cognizance of Colonel Barkstead (one of the Regicides), the Lieutenant of the Tower. Messages were conveyed from Read to Wiseman, and Wiseman was pressed to reply. He sent Read £5 and a note which Wiseman afterwards stated was worded thus: "Sir, those paines you complaine of will easily discusse, and so will that in your head,

without the taking a course of phisicke." The messages were copied by Colonel Barkstead and communicated to Secretary Thurloe. The above note was interpreted to mean that Read's escape was assured, and that he need not fear that he would lose his head. When we consider that Wiseman had been so closely associated with the Royalist cause and that, as he himself says in a petition to Thurloe, his practice was chiefly amongst the Royalists in London, it is not surprising that the events just described led to Wiseman's arrest.

He was imprisoned in the Tower until Cromwell's decision regarding him was known, when he was taken to Lambeth House, at that time used as a prison, but formerly the residence of Archbishop Laud, and now known as Lambeth Palace. After a month's imprisonment, Wiseman forwarded a petition to Secretary Thurloe praying for release, offering to give security that he would be ready to answer any crime that could legally be proved against him, and promising that he would "do nothing to the publique prejudice." [1]

Wiseman tells us that during the time he was "imprisoned by the Fanaticks in Lambeth House," he was allowed to attend a consultation on one of the prisoners there, and to continue treating the case.

At last Wiseman, it is supposed, at the intercession of some of his friends, obtained his release. He resumed his practice in London and remained there for at least two years. Longmore thinks that his practice, which was chiefly amongst the Royalists, gradually fell off, and, at last, in 1657 (or in the following year), he followed the example of many Royalist officers, and, leaving England, took service as a surgeon in the King of Spain's navy.

We know from his writings that he served for three years in the Spanish Navy. Part of this period was probably spent in the West Indies, for when describing how, although persons may be exposed to the same source of infection yet those of sound constitution frequently escape, he illustrates this fact by saying, "of which I have seen the frequent experiment during the three years I served in the King of Spain's Navy, where our mariners as soon as their pockets were full of money would be getting ashore to the Negroes and others that usually attended their landing."

In his chapter, "Of Wounds of the Face," Wiseman relates

[1] "This petition and other papers relating to the affair can be found by the curious in Birch's "Thurloe Papers."

a case which occurred during his service in the Spanish Navy. He says, "Whilst I served among the Dunkirkers, where *Snick and Snee* was, as it were, a fashion, I had much of this kind of work"—namely, the cure of face-wounds due to fights with knives. Wiseman's ship was at anchor in the Groine when three ships for the King of Spain, manned by Hollanders, came in from Hamburg. The boatswain of one of these vessels was drinking with some Spanish sailors on shore, and becoming drunk, began to talk about religion, and upbraided one of the Dunkirkers for wearing a cross. After declaring, with curses, "he would not wear a Cross, no, the Devill take him, one of our men beat him down and fell with him; then kneeling upon his breast, and holding his Head down, he drew out a knife sticking in his Sash and cut him from the Ear down towards the Mouth, then from under the Eye from that Cheek-bone to the nether jaw. '*Now,*' said he, *you shall wear a Cross that the Devill do not carry you away.*'" Wiseman was called in to attend his co-religionist, and describes very fully how he stitched up the wounds, the dressings he applied, and the care taken in feeding the patient to prevent interference with the progress of healing. In a short time "the Patient was well pleased with his cure, though there remained some marks of the Cross."

On the termination of his three years' service in the Spanish Navy Wiseman returned to London and resumed the practice of his profession at his house near the Old Bailey. He was living there when Charles II and his Court returned to London at the Restoration. Soon after this date Wiseman moved westward to a house in Covent Garden (then known as Convent Garden), where he spent the remainder of his life. Ten days after the return of Charles II to London, on June 8, 1660, Wiseman was appointed "Surgeon in Ordinary for the Person." This would appear to have been a special mark of the King's favour, for Wiseman was supernumerary to the regular establishment for over a year.

On the death of the King's Surgeon, Michael Andrews, Wiseman, on August 5, 1661, was formally granted by Royal Warrant the vacant appointment. In June he had been granted a pension of £150 a year (State Papers), and the Warrant included the usual salary of a King's Surgeon of £40 a year.

Three other Surgeons claimed at this time the appointment of Serjeant-Surgeon. Richard Pile had been Serjeant-Surgeon to Charles I, and claimed the appointment as his by right. John Knight and Humphrey Painter had also held appointments as Surgeons to the Household of Charles I. In 1661, all three were

officially appointed as Principal Surgeons and Serjeant-Surgeons, and later, Richard Pile was appointed "First Principal Surgeon." Pile had been (with Wiseman) with the King in the West of England, and in Jersey. Knight, as Surgeon-General, directed the medical affairs of the Army, and perhaps of the Navy also.

On the death of Serjeant-Surgeon Humphrey Painter, Wiseman was appointed Principal Surgeon and Serjeant-Surgeon. He was sworn into office on March 25, 1672, but the appointment dated from February 15. In February, 1674-5, his pension of £150 a year was renewed "for life."

For some years Wiseman had been suffering from occasional attacks of hæmorrhage from the lungs, and he became a confirmed invalid for several years before his death.

He refers in his writings to several attacks of hæmoptysis.

On one occasion, after trepanning a patient for depressed fracture of the skull, he tells: "Going out of his close room into the fresh air, I presently burst out with a violent coughing of blood." And again, he writes that, "In the year of the great Sicknesse, whilst I was in the North-country, a Gentleman sent his servant to me who had some half a year before luxated his right shoulder. He had been with a Bone-setter, who made him believe he had set it; but, upon sight of it, I concluded it luxated, and felt the head of the Humerus lying in his arm-pit. I being then lame of my fractured leg, and indisposed with coughing blood, advised the man to return to his Bone-setter and tell him what I had said." After consulting several bone-setters the man returned to Wiseman with the bone still dislocated. With the aid of "the Pulley and Coulstaffe" Wiseman reduced the dislocation, and the man recovered the full use of his arm.

It is to his gradual withdrawal from the active practice of his profession on account of ill-health that we owe the production of his writings. In his "Epistle to the Reader," dated May 24, 1676, he states that his treatises were written "in those hours which a frequently repeated sickness hath for this 20 years last past deny'd me the use of my private occasions," and goes on to say that his state of health had given him "opportunity of reading and thinking as well as practising; both which are necessary to the accomplishment not only of an author, but indeed of a chirurgeon."

In the summer of 1676 Wiseman went to Bath in the hope of improving his health. Whilst there, on August 20, 1676, the end came, apparently rather suddenly, for he died without signing his will, although he verbally declared it to be his last will in the

presence of witnesses, and it was afterwards proved. In this will he desired that he might be buried near his first wife in the Church of St. Paul, Covent Garden, and in that church, on the ninth day after his death, his remains were interred. This church was afterwards burnt down and replaced by the present edifice.

Wiseman was twice married. Of his first wife we only know that she was named Dorothy, that she had a niece Mary Doughty, and died in February, 1674. Wiseman married again about a year after the death of his first wife. His second wife was Mary Mauleveror, sister of Sir Thomas Mauleveror, and grand-daughter of the first baronet, who was one of the members of the High Court of Justice which sentenced Charles I to death, and whose signature was attached to Charles's death warrant. At the time of his death Wiseman's wife was pregnant, and she subsequently gave birth to a son. This son was named after his father but died in childhood in 1678, and was buried with his father. Mrs. Wiseman afterwards married Mr. Thomas Harrison, of Gray's Inn. She died in 1680, and was buried in St. Paul's Church.

Wiseman left no direct descendants. He had two sisters, one of whom was named Hastings, and he refers in his writings and his will to his kinsman Jacques Wiseman, who had been apprenticed to him on May 5, 1663. Jacques Wiseman became freeman of the Company of Barber-Surgeons in 1672. He was the son of Samuel Wiseman, a London apothecary, and is by some thought to have been a nephew of Richard Wiseman, but this has not been proved. From an entry in the Calendar of State Papers, Domestic, 1666, he appears to have been appointed Chirurgeon to the Earl of Carlisle's Regiment. He certainly obtained a commission as Chirurgeon to Lord Carlisle's Regiment on January 22, 1673, and was, four days later, transferred to the Duke of Albemarle's Regiment. He afterwards settled down in practice in Long Acre, and left an only child, a daughter, and £30,000, at his death in 1710.

Richard Wiseman, towards the end of his life, was very comfortably off. His fees as Principal Surgeon and Serjeant-Surgeon, and his annuity of £150 a year came to £256 13s. 4d. a year. This would be equivalent to over £1,026 a year at the present time. In addition, when lodgings were not available at Court, he received lodging allowance at the rate of £1 a week. In his writings he only once mentions a fee, and this was a remarkable one. The patient had been suffering from syphilis for seven years, had been treated by many surgeons, and, at last, came to Wiseman at the

time when he was a prisoner in Lambeth House. The patient was put under a course of mercury, and at the end of a month was practically cured. He was not, however, completely satisfied, and retired into the country for two years. On his return to London "he acknowledged to me his cure," writes Wiseman, "by settling £30 a year upon me during his life, and paid me £60 for the two years passed." This annuity was equal to £120 a year in modern money. Wiseman's will shows that he held a mortgage on the estate of his brother-in-law, had lent £2,000 to different persons, and had the "several estates and leases" "of the Rectory of Stroubby and Barnby and alsoe the Fee Farm of Feckenham Parke in Worstershire, And also my two tenements in the Strand in the County of Middx." He owed £2,000 to Mr. Edmond Wiseman, Mercer, who does not appear to have been a relation.

Two portraits of Wiseman are known to exist. One is a miniature in water-colours by the eminent painter Samuel Cooper; the other is an oil painting supposed to have been painted by Sir Balthazar Girbier. The miniature, which is in the possession of the Duke of Rutland, is dated 1660, and a reproduction of it in photogravure forms the frontispiece of Sir Thomas Longmore's "Richard Wiseman, a Biographical Study." The portrait, in oils, is in the London Royal College of Surgeons (a reproduction forms the frontispiece of this article).[1] If painted by Girbier, it was executed before 1667, the year in which the artist died, and probably, therefore, shows Wiseman when 40 years of age or a little over, and not "fifty years old or upwards," as described by Sir Thomas Longmore. It is the portrait of a thoughtful, scholarly-looking man, with honest eyes, a good strong chin and a resolute mouth.

Wiseman was a well-educated man. He was a good Latin scholar, for his works contain many quotations from classical writers. He refers to the writings of Hippocrates, Galen, Celsus, Fallopius, Scultetus, Botallus and others. Latin was the language of the learned in his day, and we find country practitioners when consulting him frequently writing the notes of their cases in that language. He wrote good English and had no difficulty in conveying his ideas in simple, direct language. Sir Thomas Longmore points out that, at a time when erratic spelling was the rule, Wiseman's spelling very closely agrees with that of the present day.

Richard Wiseman's first book appeared in 1672. The title-page runs "A Treatise of Wounds, by Richard Wiseman, one of His

[1] Reproduced by permission of the President of the Royal College of Surgeons.

Majestie's Sergeant Chirurgeons. London: Printed by R. Norton for Richard Royston, Bookseller to His Most Sacred Majesty, 1672." This is an 8vo volume of 277 pages. It is a very rare book, for only two copies are known to exist: one in the British Museum Library, the other in the Library of the Royal Army Medical College at Millbank. The British Museum copy has been disfigured by notes written on its pages. The copy belonging to the Royal Army Medical Corps is in beautiful condition, well-bound and decorated. It was presented by Sir James McGrigor, Bart., Director-General, A.M.D. This book contains a "Letter to the Reader," is divided into two parts and has an Appendix. The first part contains the treatise on wounds, the second part that on gunshot wounds, and the Appendix deals with burns, gangrene and sphacelus, fistulæ and fractures. Wiseman says he has other treatises, "which ly rough cast," on tumours, lues venerea, and king's evil.

At the end of the volume appear the words "*Imprimatur*, April 4, 1672, Guliel. Wigan." This signifies that the book was published with the license of the Bishop of London, William Wigan being Chaplain to the Bishop at that date. By a statute of Charles II, books of divinity, physic, philosophy, science or art could not be published in London without the authority of the Archbishop of Canterbury or Bishop of London.

It may be noted that this book was written specially for naval surgeons. In this, his first work, he was afraid to describe many of his cases for fear of offending his patients or other surgeons, "so many, both surgeons and patients, therein concerned, being alive." The treatises, apparently, were originally written as lectures to be delivered at the Hall of the Barber-Surgeons' Company. That on "Fractures" was so delivered just before the Great Fire of London. The fire burnt down part of the Hall and probably interrupted the course of lectures.

In 1676 appeared what was really a second edition of his book of 1672, but as it bore a different title it has been considered the first edition of "Several Chirurgical Treatises. By Richard Wiseman, Sergeant-Chirurgeon." Thus the edition of 1686, a well-preserved copy of which can be seen in the Library of the Bristol Medical Association, bears the words "the Second Edition." Later editions which appeared in 1696, 1705, 1719, and 1734 expand the title to read "Sergeant-Chirurgeon to King Charles II." All these are unaltered copies of the 1676 edition, which was the last one Wiseman prepared for the press. In addition, there is a spurious second edition, dated 1692, the origin of which was due

to the sharp practice of a printer named Samuel Clement, who obtained copies—probably remainders—of the 1676 and 1686 editions and, removing the title-pages, inserted new title-pages printed by himself.

The 1676 and later editions do not bear the *imprimatur* of the Bishop of London. They were censored by the Corporation of Barber-Surgeons in accordance with the rules of that body, but, in addition, they obtained the approval of the College of Physicians. This approval was signed by the President, Censors and Registrars of the College and appears in Latin at the beginning of each edition. Translated, it runs, "We judge this will be of great advantage to physicians equally with surgeons if these chirurgical treatises be committed to the press."

The Library of the Royal Army Medical College is rich in editions of Wiseman. It possesses those dated 1672, 1676, 1696, 1719, and 1734.

The 1676 edition, from which the quotations in this memoir have been taken, was dedicated to Charles II. It is the 1672 book expanded, corrected, and re-arranged. It contains many more illustrative cases. The "Letter to the Reader" of the 1672 edition is replaced by an "Epistle to the Reader," which ends with the words "thy friend and servant, Richard Wiseman," and bears date May 24, 1676. The later editions also contain this epistle.

The treatises are eight in number, and deal respectively with tumours, ulcers, diseases of the anus, king's evil, wounds, gunshot wounds, fractures and luxations, and lues venerea.

Wiseman's writings are delightful to read; he describes his cases with great frankness, never boasts, tell, us of his failures as well as of his successes, is always loyal to the physicians and surgeons who consulted him, and acknowledges their ability. Each chapter ends with notes of cases of the diseases or injuries described in the chapter, and his patients are introduced to the reader with a few descriptive touches which enable one to visualize the person. Thus: "An officer of the King's Regiment of Foot, of a sanguine and healthful constitution, marching at the head of his Company in a hot Summer's day, heated his Bloud, and was seized with a pain in one of his teeth of the lower right jaw"; "A Person of Honour, of a full Body abounding with sharp Humours, was seized with an Herpes on his right leg"; "A Widow woman, aged 56 years, of a gross Body"; "A man come out of Ireland diseased with a large Tumour in the lower Belly"; and so on. Over 600 "observations" of cases of surgical disease or injuries are described by him.

We may note that Wiseman described himself as an "Artist in Chirurgy." As an operator he shows himself to have been bold but cautious. His views on amputation may be gathered from a few extracts from his writings. He writes : "In heat of Fight, whether it be at Sea or Land, the Chirurgeon ought to consider at the first Dressing what possibility there is of preserving the wounded member ; and accordingly, if there be no hopes of saving it, to make his Amputation at that instant while the Patient is free of Fever." "Among the Cruisers in private Fregats from Dunkirk it was complained that their Chirurgeons were too active in amputating those fractured members, as in truth these are such silly Brothers who will brag of the many they have dismembered, and think that way to lie themselves into credit. But they that truly understand Amputation and their Trade will know how villainous a thing it is to glory in such a work." He again remarks : "Consider well the Member, and if you have no probable hope of Sanation, cut it off quickly, while the Souldier is heated and in mettle. But if there be hopes of Cure, proceed rationally to a right and methodicall Healing of such Wounds; it being more for your Credit to save one Member than to cut off many." He liked the patient to be seated in a chair during the amputation.

He did laparotomy for strangulated hernia and for the radical cure of hernia, placing "The patient flat on the table with his Heels raised up : then one of the Assistants shall press with his hand on the bottom of the belly."

Wiseman was the great practical surgeon of his day, and a comparison of his teaching with that of writers before his time, such as Clowes and Woodal, shows the very great progress surgery had made; but, at the same time, we find him clinging to many of the superstitions of the past, to many of the old methods of treatment, perhaps not because he believed in them himself but because he knew they were accepted by his contemporary brother surgeons, and as he puts it himself when referring to the use of tents to keep open abdominal wounds, as was then the custom, which he condemned, "Yet if it be not done, the chirurgeon is usually condemned by common vogue ; therefore it is that, against their own judgment, they keep them tented, often to the ruin of their patients." This fear of losing the support of his brother surgeons prevented him from doing laparotomy in cases of abdominal wounds and suturing the wounded intestine, although he thought it the correct procedure. He expresses his belief, as a good Royalist was bound to do, in the efficacy of the King's touch for the cure of King's evil, and we

find him recommending as an application to restrain the growth of cancerous tumours, "the Oyl of Frogs made by baking them with butter in their mouths." But on occasion we find him ignoring common practice and public opinion when he felt that it was in his patients' interest to do so. Thus he found no difficulty in finding simple substitutes for the complex materials in common use in surgery at that time when the needs of his patient demanded it.

We must agree with Sir Thomas Longmore when he states that the publication of Wiseman's treatises "showed that a cultivated and scientific education and special study were as essential for a good surgeon as for a good physician," and that "there is the strongest ground for believing that the remarkable advance which took place in England in surgery in the century after Wiseman's death was largely traceable to the fact of his writings having been so widely diffused, as they were towards the close of the seventeenth and beginning of the eighteenth centuries."

In the midst of the turmoil and strife of a revolutionary period, a time of callousness to human suffering, Wiseman devoted his life to his humane and noble profession; in a drunken age he was a water drinker, and at a time when licentiousness was rampant we have every reason to believe he led a moral life. When we ponder over his life's work and its influence on the profession he loved so dearly, we cannot but be proud of the fact that he was an English Army Surgeon.

[Chief Authorities: "Richard Wiseman, A Biographical Study," by Surgeon-General Sir T. Longmore, C.B., Q.H.S., F.R.C.S. "Contributions towards a Memoir of Richard Wiseman," by James Dixon, F.R.C.S., in the *Medical Times and Gazette*, October 19, 1872. "Richard Wiseman and the Surgery of the Commonwealth," in "Disciples of Æsculapius," by Sir B. W. Richardson. Lives in Aikin's "General Biographical Dictionary," and in the "Dictionary of National Biography."]

TRYPANOSOME DISEASES OF DOMESTIC ANIMALS IN UGANDA.[1]

IV.—TRYPANOSOMA UNIFORME, SP. NOV.

BY COLONEL SIR DAVID BRUCE, C.B., F.R.S.; CAPTAINS A. E. HAMERTON, D.S.O., AND H. R. BATEMAN, R.A.M.C.; AND CAPTAIN F. P. MACKIE, I.M.S.

INTRODUCTION.

THE name *Trypanosoma uniforme* has been given to this species on account of the uniformity in shape and general appearance which characterizes it.

Only four oxen were found by the Commission to show this trypanosome in their blood. One was received from Sir Apolo Kagwa, K.C.M.G., the Prime Minister, on August 30, 1909, and its blood at once inoculated into a series of animals. The other three came from the Uganda Company's estate at Namukekera.

The ox, goat and sheep were found to be susceptible, while the monkey, dog, guinea-pig, rat and mouse proved refractory. This was the case with *Trypanosoma vivax*, and in truth these two species resemble one another very closely. *T. uniforme* differs from *T. vivax* in size, and perhaps to a slight extent in shape; but, from the small amount of material at the disposal of the Commission, it would be rash to generalize.

The few facts gathered will, therefore, be put on record, in order to draw the attention of future workers on Uganda trypanosomes to its presence.

MORPHOLOGY OF TRYPANOSOMA UNIFORME.

A. *Living, Unstained.*

This is a small and active trypanosome, which has a marked translatory movement in the field of the microscope. This movement, however, is not to be compared with that of *T. vivax* in point of rapidity or range. The rapid vibratory movement of the body and flagellum sometimes slows down for a perceptible fraction of time; but this trypanosome does not become completely quiescent as is commonly the case with *T. pecorum*. The cell-contents are clear and homogeneous, without any appearance of a vacuole.

B. *Fixed and Stained.*

Length.—This trypanosome is smaller than *T. vivax*. The average is 16·0 as against 23·7 microns. The following table gives the average length of this trypanosome in the ox, goat and sheep.

[1] Reprinted from the *Proceedings of the Royal Society*, 1910, B, vol. lxxxiii.

Twenty trypanosomes are drawn and measured from each preparation, the average length reckoned, and the length of the longest and shortest given :—

TABLE I.—TRYPANOSOMA UNIFORME.

Number of experiment	Animal	Method of fixing	Method of staining	In microns		
				Average length	Maximum length	Minimum length
1437	Ox	Osmic acid	Giemsa	16·0	17·5	15·0
1442	,,	,,	,,	16·0	18·0	14·0
1442	,,	,,	,,	16·3	19·0	14·0
1581	,,	,,	,,	16·5	19·0	14·0
1732	,,	,,	,,	15·5	17·5	13·5
1734	,,	,,	,,	15·3	17·0	14·0
1689	Goat	,,	,,	16·4	17·5	15·0
1694	,,	,,	,,	17·7	19·0	16·0
1694	,,	,,	,,	14·7	16·0	13·0
1497	Sheep	,,	,,	17·8	19·0	16·0
1497	,,	,,	,,	14·7	16·0	12·0
				16·0	19·0	12·0

The following table represents the distribution in respect to length of 200 individuals of this species of trypanosome :—

TABLE II.—DISTRIBUTION IN RESPECT TO LENGTH OF 200 INDIVIDUALS OF TRYPANOSOMA UNIFORME.

Number of experiment	Microns								Average, in microns
	12	13	14	15	16	17	18	19	
1437	—	—	—	5	10	5	—	—	16·0
1442	—	—	3	2	9	4	2	—	16·0
1442	—	—	1	6	5	5	1	2	16·3
1581	—	—	1	3	8	2	4	2	16·5
1734	—	—	4	8	6	2	—	—	15·3
1689	—	—	—	3	6	11	—	—	16·4
1694	—	—	—	—	2	5	9	4	17·7
1694	—	1	8	7	4	—	—	—	14·7
1497	—	—	—	—	4	7	8	1	17·8
1497	1	—	7	6	6	—	—	—	14·7
Totals ..	1	1	24	40	60	41	24	9	
Percentages	0·5	0·5	12·0	20·0	30·0	20·5	12·0	4·5	

Breadth.—Varies from 1·5 to 2·5 microns.

Shape.—This species of trypanosome seems to differ in shape from *T. vivax* in that there is not the marked narrowing or constriction opposite the nucleus. The posterior extremity is rounded or blunt, and in this resembles *T. vivax*.

Contents of Cell.—Resembles *T. vivax* in showing the appearance of clear protoplasm with fine alveolar structure.

Nucleus.—Oval in shape and compact; not, as a rule, situated in a narrowed part of the body or waist, as in *T. vivax.* It also seems to be placed about the centre of the body, and does not take up the whole width of the cell as in the closely allied species.

Micronucleus.—Resembles *T. vivax* in being large, round, and terminal.

Undulating Membrane.—Narrow and little developed, as in *T. vivax.*

Flagellum.—There is a well-marked flagellum, the free part varying from 2 to 5 microns in length.

ANIMALS SUSCEPTIBLE TO TRYPANOSOMA UNIFORME.

Date	No. of experiment	Source of virus	Period of incubation, in days	Duration of disease, in days *	Remarks
			Cattle.		
1909 Aug. 7..	1442	Nat. infec.	?	5	Died of *T. uniforme.*
,, 30..	1581	,,	?	61	Killed.
,, 11..	1732	,,	?	79	Died of *T. uniforme.*
,, 11..	1734	,,	?	80	Killed.
			Goat.		
Sept. 1..	1491	Ox 1581 ..	15	18	No *post-mortem.*
,, 16..	1689	,, ..	18	34	,, ,,
,, 18..	1694	Goat 1491	9	35	,, ,,
,, 24..	1716	Ox 1581 ..	—	—	Never showed trypanosomes; under observation 40 days.
		Average ..	14	29	
			Sheep.		
Sept. 16..	1497	Ox 1581 ..	18	46	Killed.
,, 1..	1601	,,	—	—	Never showed trypanosomes; died 10 days after inoculation.
,, 24..	1717	,,	—	—	Never showed trypanosomes; died 13 days after inoculation.
			Monkey.		
Sept. 1..	1653	Ox 1581 ..	—	—	Experiment stopped after 34 days.
			Dog.		
Sept. 1..	1600	Ox 1581 ..	—	—	Experiment stopped after 34 days.
			Guinea-pig.		
Sept. 1..	1599	Ox 1581 ..	—	—	Experiment stopped after 34 days.
			Rat.		
Sept. 1..	1597	Ox 1581 ..	—	—	Experiment stopped after 34 days.
			Mouse.		
Sept. 1..	1598	Ox 1581 ..	—	—	Experiment stopped after 34 days.

* Duration includes the days of incubation; it dates from the day of infection.

Cultivation of T. uniforme.

No attempt was made to cultivate *T. uniforme.*

Carrier of T. uniforme.

No experiments were made in the laboratory with *Glossina palpalis* as a carrier of *T. uniforme,* and no evidence is to hand as to what the carrier is.

Conclusions.

(1) *T. uniforme* resembles *T. vivax* in shape and general appearance, but differs markedly in size.

(2) It also resembles *T. vivax* in not being pathogenic to the smaller laboratory animals.

(3) There is no evidence available, as in the case of *T. vivax,* as to what the carrier of *T. uniforme* is.

APYREXIAL MALARIA CARRIERS.

By Major G. E. F. STAMMERS,
Royal Army Medical Corps,

AND

Captain G. I. DAVYS,
Indian Medical Service.

The apyrexial malaria carrier is perhaps not very generally recognized as a means of the propagation of malaria, although from time to time certain investigations have shown that the disease may be spread by a carrier.

The condition is a peculiar one in that the apyrexial carrier may never have had, so far as can be ascertained, any attack of malaria, may be in perfect health and apparently quite fit in every way to do full military duty, and yet be found to be harbouring the sexual forms of the parasite in the peripheral circulation.

In India the first observation of this kind relating to adults was made by Major S. R. Christophers in 1901; he then found the condition to exist amongst apparently healthy European soldiers at Mian Mir; out of eighty-six examined, nineteen were found to be carriers. Major S. P. James observed a similar condition amongst the European soldiers in the same cantonment in 1908. In 1909 the Medical Officers in Ferozepur examined 211 apparently healthy European soldiers and found twenty-five carriers amongst them. In the same year Dr. Bentley brought the subject prominently to notice by his investigations in Bombay; in this case natives were examined.

Outside India the condition has also been found to exist in Algeria, in Egypt, and in the Federated Malay States, &c.

From the above it is evident that the condition has been recognized in the past, and this account is only intended to show that the matter is of some importance and should not be lost sight of.

That it is of moment may be seen from the state of affairs that existed in Quetta in 1911. The 2nd Battalion of the Royal Irish Fusiliers arrived at the end of November, 1910, from Ferozepur (a station where apyrexial carriers had been previously noted, as above mentioned). Nothing noteworthy in the malaria incidence amongst the troops in the Quetta garrison was observed until

towards the end of August, 1911, when it became evident that this regiment was suffering disproportionately from malaria when compared with the other regiments and troops in the station.

It seemed somewhat hard to find a reason for this, as the 2nd Royal Welsh Fusiliers (who arrived from Shwebo in Burmah on April 1, 1911, vià Karachi, where they spent some months *en route*) showed no increase of malaria, although lying alongside the Royal Irish Fusiliers in barracks of much the same design, and in an identical position as regards the local conditions predisposing to malaria.

Accordingly it seemed probable that some special cause was at the bottom of the trouble in the Royal Irish Fusiliers, and one of us suggested that this peculiar condition (apyrexial carriers) might be the cause, although the regiment had left Ferozepur for a considerable time.

In order to determine whether carriers did exist an examination of the entire regiment was proposed and duly carried out. The results fully justified the suggestion; 957 men were examined, out of whom 124 were found to be carriers; every man examined was at the time doing full military duty, and in many instances no history of previous malaria could be elicited. The varieties of organisms found were as follows: Malignant tertian 39, benign tertian 84, quartan 1. In each case an ordinary film and a "thick drop" preparation were examined, making a total of 1,914 specimens, six minutes being expended on each slide on an average.

A fact that had been previously observed was confirmed—namely, that the taking of quinine in prophylactic doses has no effect on the condition. On September 10 the whole regiment was put on quinine prophylactically (15 gr. twice weekly on two successive days), and while this had an excellent result in markedly reducing the fresh cases of the disease, it had no appreciable effect on the number of carriers found. After the prophylactic issue of quinine had been in force for some time, it was noted, however, that in malignant cases crescents became increasingly more frequent, and rings were not so often found; this is in accord with the generally accepted opinion that quinine in moderate doses is conducive to crescent formation.

Another fact worthy of note is the persistence of the apyrexial carrier; for fully a year after the men had left Ferozepur the condition was abundantly in evidence.

Apart from the question of apyrexial carriers the investigation

was interesting as an example of the "domestic" habits of *Neocellia Stephensi;* this mosquito was found to infest an irrigation channel distant about a quarter of a mile from the barracks of both the Royal Irish and Royal Welsh Fusiliers; no other Anophelines were known to be breeding in the neighbourhood.

The Royal Irish and Royal Welsh Fusilier barracks are side by side, separated only by the width of a roadway, and identically situated as regards mosquito population. The Royal Irish Fusiliers with their abundant apyrexial carriers had numerous cases of malaria amongst them; the Royal Welsh Fusiliers showed no abnormal incidence of malaria, although at no time was prophylactic quinine issued to them. The difference appears to have been due to the well recognized "domestic" habits of *N. Stephensi.* There is no doubt that it was fortunate that this mosquito was the conveying agent in this case; had *Myzomyia culicifacies* (of which a sub-variety is very common in Quetta) been the transmitting agent it is quite possible that the increased incidence of malaria would not have been confined to the Royal Irish Fusiliers.

The comparatively low incidence of malaria normally present amongst troops in Quetta is certainly against the probability of the apyrexial type of the disease existing there, as it is scarcely possible to conceive a body of people heavily infected with carriers without a correspondingly heavy incidence of malaria, as exemplified in the case of the Royal Irish Fusiliers. In Quetta *M. culicifacies* and *N. Stephensi* occur in large numbers; these, with a highly infected population (viz., apyrexial carriers), would certainly lead to a very high incidence of malaria as a normal state of affairs.

A SMALL EPIDEMIC OF TYPHOID FEVER IN CONNECTION WITH SPECIFICALLY INFECTED FLIES.

By Major E. W. W. COCHRANE.
Royal Army Medical Corps.

THE possibility of the spread of infection in enteric fever by flies has been generally acknowledged for some years, but few records are to be found of cases where enteric bacilli have been recovered from infected flies in connection with an outbreak of the disease. Even in the case of infected flies being found it is difficult to state definitely the exact means by which the infection has been carried to the individual. The probability is that food is the medium through which the specific germs reach the person infected; and the article of food which offers the best medium for the growth and multiplication of the bacilli is milk. The chief difficulty in tracing the exact channel of infection in a series of cases of this disease, is that the incubation period is long, i.e., in most cases over ten days, so that investigations cannot be commenced for at least a fortnight after the actual infection has taken place. After this time there will be no remains of the food which has been the actual means of infection, and unless the contamination of food continues to take place it is improbable that infected food will be found. It is therefore difficult to prove the connection between infected flies and cases of the disease, but the finding of the former certainly suggests the source. It has been shown by Graham Smith in a recent Local Government Board Report [1] that the house fly may continue to be infective for at least eleven days after being in contact with specific organisms, and he concludes that with non-spore bearing organisms the infection is carried in the alimentary tract of the fly. The results of experiments as regards the range of flight of flies show that the distance may be as great as 1,700 yds., the direction being determined chiefly by the prevailing wind.

It is proposed to give an account of a small outbreak of eight cases of enteric fever which occurred in April and May, 1911, at St. George's, Bermuda, where the probable carriers of infection were flies, since, on investigation, a focus was discovered in which flies infected by the *Bacillus typhosus* were found. The following

[1] Local Government Board Report, new series, No. 53.

table shows the cases, their residences, occupations and date of commencement of illness :—

(1) Child of Captain C., aged 2, residence Kington House, Cut Road ; first day of illness, April 15, 1911.

(2) Gunner C., 3rd Company, Royal Garrison Artillery, residence No. 4b Royal Barracks ; occupation, duty ; first day of illness, April 21, 1911 ; admitted to hospital, April 27, 1911.

(3) Gunner T., 3rd Company, Royal Garrison Artillery, No. 4b Royal Barracks ; occupation, Groom to Major T. ; first day of illness, April 23, 1911 ; admitted to hospital, April 27, 1911.

(4) Miss A. G., residence Belvedere Cut Road ; occupation, cook to Major T. ; first day of illness, April 24, 1911.

(5) Mrs. L., residence 21a, Staff Block Married Quarters ; wife of Private L., A.O.C. ; first day of illness, May 1, 1911.

(6) Miss U. T., age 12, residence Belvedere Cut Road, daughter of Major T. ; first day of illness, May 1, 1911.

(7) Gunner D., 3rd Company, Royal Garrison Artillery, residence No. 4b, Royal Barracks ; occupation, groom to Captain C. ; first day of illness, May 2, 1911 ; admitted to hospital, May 5, 1911.

(8) J. T., residence Belvedere Cut Road, son of Major T. ; first day of illness, May 8, 1911.

The first case was not seen by a medical officer until April 27, 1911, when a blood capsule was taken and sent to the District Laboratory for a Widal's reaction. The serum gave a positive reaction with *B. typhosus*, and the case was typical clinically. Blood cultures were made in cases 2, 3 and 4, from each of which the *B. typhosus* was recovered. Case 5 gave a positive Widal's reaction with the *B. typhosus*, but was clinically of a mild type. A blood-culture made from Case 7 was sterile, but the Widal's reaction was positive at a later date. Cases 6 and 8 were clinically typical, and their sera reacted with the *B. typhosus* in high dilutions.

Investigations made at St. George's on April 30, 1911, suggested no definite source of infection for the first four cases, but it was found that there had been a fatal case of enteric in a coloured woman's house (Mrs. P.) near Alexandra Battery in September, 1910, and that in December, 1910, Gunner O., who lived as caretaker in the Battery, contracted the disease. The occurrence of further cases amongst the coloured people in the vicinity of the Cut Road since that date could not be ascertained.

The possibility of the infection of Cases 3 and 4 from Case 1 was carefully gone into, but no connection as regards personal

contact, common food, milk or water supply could be traced. The houses of Major T. and Captain C. are within 200 yds. of one another. The water supply (rain stored in tanks) is distinct. Each officer owned a cow whose milk supplied his household.

At Captain C.'s house there are two dry earth latrines situated close to the house. The buckets were emptied daily by a contractor who buried the night soil in the garden about 100 yds. from the house. Since no particular precautions as regards disinfection of excreta were taken during the early part of the child's illness, there was a possibility of fly infection at this period, and infected flies might have carried germs to Major T.'s house.

The source of infection in Case 2 is difficult to explain. The man occupied the same barrack room as Case 3, but according to clinical observation was infected at least two days before the latter. He had not taken any food or drink in houses on the Cut Road, nor had he been to either officer's house. Since Cases 3 and 4 were probably infected at the same time it is reasonable to assume a common source, and this could only have been at Major T.'s house where his groom had tea, but not other meals.

The infection in Cases 6 and 8 can be directly attributed to Case 4, as the cook was probably infective in the early stages of the disease, and was then preparing their food.

No direct connection could be traced between Case 5 and the other cases. The Staff Block of Married Quarters is within 400 yds. of Major T.'s house.

Case 7 contracted the disease from Case 1, as the excreta of the latter were not disinfected in the early part of his illness.

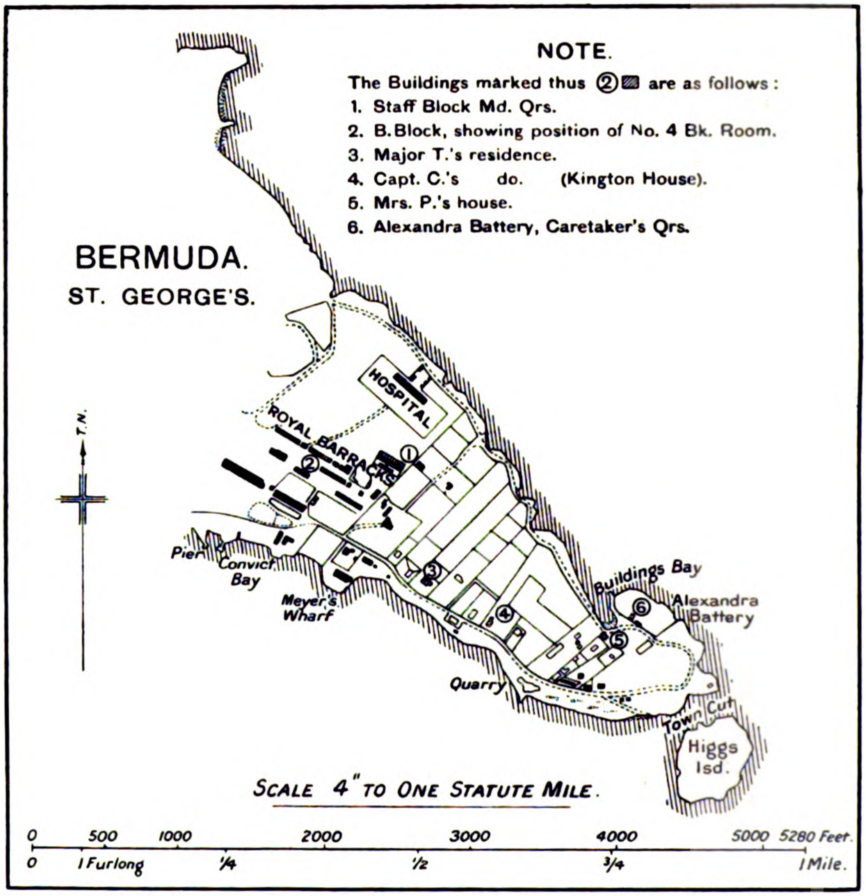
The theory of food infection by flies had been so strongly advanced here as the means of spread of the disease that this opportunity was taken to see whether any facts could be obtained in support of the theory. On May 3, 1911, five or six flies (the common house-fly *Musca domestica*) were caught at each of the following places, placed in a sterile test tube and numbered:—No. 1, Major T.'s kitchen. No. 2. Captain C.'s kitchen. No. 3. 3rd Company, Royal Garrison Artillery cookhouse, Royal Barracks. No. 4, Mrs. P.'s washhouse, which is close to the dry earth latrine used by her household.

The position of these places is shown on the accompanying map.

The method of dealing with the flies in the laboratory was as follows:—

The flies from each place were put into 5 c.c. of sterile salt

solution in a test tube, the contents of the test tube were well shaken for a minute, and bile salt broth or "Fawcus medium" plates inoculated from the fluid. These tubes or plates were labelled "external washing," and numbered 1, 2, 3 and 4 respectively. The flies were now emulsified with a glass rod in sterile salt



solution, and another series of tubes or plates made and similarly numbered. The growth in the liquid medium was plated out on the following day. The inoculated plates were examined after incubation in the usual manner. The final result was that from Nos. 1 and 2 no suspicious organisms were isolated. From No. 3 "fly emulsion" a non-Gram staining motile bacillus was recovered which

resembled the *B. typhosus* in cultural reactions in sugars, milk, gelatine and peptone solution; morphologically, it was very short, no filaments could be seen and it was more motile than a typical *B. typhosus*, gave a thicker and whiter growth on agar, and did not agglutinate with an antityphoid serum. From No. 4 "external washing" a non-Gram staining motile bacillus was recovered which gave the following reactions:—

Lactose litmus broth	No acidity.
Saccharose ,, ,, ...	,,
Glucose ,, ,, ...	Acid, no gas.
Mannite ,, ,, ...	,, ,,
Peptone solution	No indol after six days.
Gelatine	No liquefaction in ten days.
Neutral red agar	No fluorescence.
Litmus milk	Acid, no clot in ten days.

Agglutination tests:—

As no immunized animals or specific typhoid serum was available the specific serum was obtained from the patients. The sera of Cases 6 and 8 were found to give the most complete agglutination with the stock *B. typhosus*.

The bacillus under investigation was clumped completely in half an hour in 1 in 30 dilution of these sera as seen under the microscope, and completely sedimented in twenty-four hours in dilutions up to 1 in 180 in capillary tubes. Similar control results were obtained at the same time with the stock *B. typhosus*.

These reactions proved that a true *B. typhosus* had been recovered from the "external washing" of flies caught at Mrs. P.'s house on May 3, 1911. From this it may be concluded that flies at this house had access to some specifically infected matter, and that the organisms were probably carried on their feet or proboscis. Having definitely ascertained that a focus of infection existed at Mrs. P.'s house on May 3, 1911, it is reasonable to assume that this had existed previous to this date, and that infected flies were the probable carriers of infection to Captain C.'s child (Case 1). The distance between Captain C.'s and Mrs. P.'s houses is less than 300 yds. It is possible that Cases 2, 3, 4 and 5 were infected in a similar way from this house, but the infection in Cases 6, 7 and 8 was probably directly from other cases as mentioned above.

As regards the recovery of the *B. typhosus* from the "external washing" of the flies, and the failure to isolate it from the same flies after emulsification, it is possible that the coliform organisms from the intestines outnumbered the former to such an extent that

their isolation was rendered impossible. According to Graham Smith's experiments one would expect to recover the organisms from the "fly emulsion," as he says the infection is carried in the alimentary tract of the fly.

It is interesting to note that the prevailing direction of the wind during April, 1911, was north-east. An east wind would blow nearly directly from Mrs. P.'s to Captain C.'s house.

As soon as it was definitely ascertained that infected flies had been found at Mrs. P.'s house the Civil Medical Officer of Health was informed, and he took steps to have the house and especially the latrine cleaned and disinfected; since then no further cases have occurred in the vicinity.

Attempts were made to get samples of excreta from the occupant's house, but Mrs. P. refused to allow any investigation of excreta or a blood examination to be made.

THE EFFECT OF PHYSICAL TRAINING ON THE PULSE-RATE.

By Captain J. A. BALCK.

Royal Army Medical Corps.

A LITTLE over a year ago Dr. Pembrey, when lecturing to us on the physiology of physical training, made the remark that training should have the effect of slowing the pulse-rate both at rest and after exercise, and should also shorten the time of recovery after exercise. When commencing work at the gymnasium at the Curragh I determined to see how far the ordinary physical training of the recruit had this effect. For this purpose I took observations for nine months, obtaining records from some 700 men. I decided only to make use of those in which I had taken at least three observations at intervals of one month. This brought down my available numbers to 495 men, of whom I now give the results.

My method was to take a man's pulse at rest, give him a certain definite exercise to do, take his pulse immediately on completion of the same, and then at quarter-minute intervals afterwards until its return to normal. By return to normal I mean when it reached a figure within 8 beats of the original one. I felt constrained to make this allowance as I found, as a matter of practice, that a man's pulse-rate is not constant, but varies within limits of which 8 beats is about the average. As for the exercise selected, it had, of course, for comparative purposes, to be the same in every case. It had at the same time to be simple enough for everyone to be able to carry it out, and severe enough to cause an appreciable rise in the pulse-rate. After some experimenting I finally selected No. 113 in the Manual—Heels raising and Knees bending. This, when carried out smartly, gave, I found, an average rise of 25 beats to the minute, which was sufficient for the purpose.

The first point, then, was to determine the effect on the pulse-rate at rest. For this purpose I divided the men into five classes as follows:—

Class 1	..	..	Pulse-rate	at rest	under 64
Class 2	..	..	,,	,,	64—72
Class 3	..	..	,,	,,	73—80
Class 4	..	..	,,	,,	81—88
Class 5	..	..	,,	,,	over 88

The apportionment of men to these classes before and after training was as follows:—

	Under 64. Per cent.	64—72. Per cent.	73—80. Per cent.	81—88. Per cent.	Over 88. Per cent.
Before training ..	2·9	20·4	34·6	31	11·1
After training ..	2·2	20	39·8	34	4

It will be seen that there is very little difference except in the last group, which, I think, represents the abnormal pulses, and which has perceptibly diminished. The cause of these abnormally quick pulses I will discuss later.

We next come to the pulse-rate after exercise. Here again I have classed the men into the same groups, and their pulse-rates after exercise were as shown in the following table, where the top line gives the class to which a man belongs, and the others the average pulse-rate of that class immediately after exercise :—

	Under 64	64—72	73—80	81—88	Over 88
Pulse-rate before training ..	85	97	105	111	127
,, after training ..	90	98	100	101	108

Here it will be seen that the most marked change is again in the last group, and to a certain extent also in the previous one.

Finally, we come to the time of recovery. Where I have shown the same as 0 minutes it means that the acceleration caused by the exercise was only 8 beats, or less than 8 beats, an amount which, as I have previously said, I considered within the limits of the normal pulse. The same division into classes has been made.

Pulse-rate	Time of recovery						
	0 m. Per cent.	½ m. Per cent.	¾ m. Per cent.	1 m. Per cent.	1¼ m. Per cent.	1½ m. Per cent.	2 m. Per cent.
Under 64—							
Before training ..	—	84·7	7·65	7·65	—	—	—
After training ..	7·65	84·7	7·65	—	—	—	—
64—72—							
Before training ..	1·0	79·6	13·3	4·1	—	1·0	1·0
After training ..	6·1	87·8	5·1	1·0	—	—	—
73—80—							
Before training ..	2·4	75·0	13·0	6·6	—	1·8	1·2
After training ..	8·45	85·7	2·93	2·92	—	—	—
81—88—							
Before training ..	5·4	74·8	9·5	6·1	1·4	2·8	—
After training ..	9·0	86·4	4·6	—	—	—	—
More than 88—							
Before training ..	—	72·1	3·7	18·5	3·7	1·9	—
After training ..	7·4	77·7	9·3	5·6	—	—	—

It will be seen that while improvement has taken place all round it is again by far the most marked in the last group. In fact the whole matter may be thus summarized: The physical training of the recruit appears to have little effect on the pulse-rate at rest or after exercise. The effect on the time of recovery is somewhat more marked. The exceptions to this are recruits with a pulse-rate over 88, as in these improvement is considerable all round.

I have deferred until now some consideration of the normal pulse-rate, and also of the cause of any departures therefrom. The majority of text-books give it as 70 to 72. I have already stated that I think the variations of the individual are much larger. But apart from that, it will be seen that the majority of my men gave figures in some cases considerably above 72. I think the explanation is the fact that while the text-book rate was probably attained with the man lying down and absolutely at rest, I took my counts with the men standing and also after having done a certain amount of exercise in the way of marching down to the gymnasium, &c. This, I think, would be quite sufficient to account for the higher rate. But taking the average pulse, to rank from 64 to 88, there was a small number who were normally below that figure and a larger proportion who were above it. Of the former I have no explanation to offer. They were perfectly healthy men, and one is driven to the conclusion that it was "constitutional." Of the latter I think that apart from a few cases of actual cardiac disease, which were speedily invalided, by far the greater number were affected by excessive cigarette smoking. I cannot speak too strongly of the pernicious effect this seems to have on the young soldier. He develops a characteristic pulse, not only very rapid but very small, and with markedly lengthened time of recovery. After a time I grew able to detect it by the feel alone, hardly requiring the corroboration of the stained fingers. Luckily I was able to exercise some pressure on these men by refusing to pass them out of the gymnasium until I saw some improvement in them. A large number did, I think, at least temporarily give up the habit, and to that I ascribe mainly the improvement shown in the tables.

PRACTICAL HINTS ON MARCHING AND HEALTH ON ACTIVE SERVICE.

By G. FAHEY.
Late 88th Connaught Rangers.

PART I.

PHYSICAL FITNESS.

Physical fitness, as required in the Army, is the highest all-round fitness that it is possible to reach, for in no other profession or calling are the tests of bodily endurance and physical strain likely to be of so severe and varied a character as those called for from the soldier.

To be in a perfect state of fitness, a man should not only be, as is said of the horse, "sound in wind and limb," but every organ and sense of the body must be unimpaired, and the general health and physical condition of the body fit to endure successfully the trials and exposures of campaigning in any part of the world in which he may be called upon to serve.

Excellence in any one branch of physical development is of no account if all-round fitness is absent. Of what use would a man be on service if he had the muscular development of a Sandow, yet his feet were so imperfect that they could not stand the strain of a long march without becoming so sore and inflamed as to necessitate his leaving the ranks, thus becoming a hindrance to his unit's efficiency, instead of adding to its standard of usefulness.

Again, supposing a man, though possessed of the strength and agility of the champion wrestler, were so deficient in his range of vision that he could not discern objects a few hundred yards away, or his hearing was not perfect enough to note the approach of footsteps or movements near his post at night: Such a man would be a danger to his force, and the sooner he was out of it the better it would be for its safety.

Excessive muscular development is no criterion of general all-round physical fitness. In fact, too often the case may be that a well-developed body, showing muscles and sinews like iron and whipcord, is but an outward and deceptive show. The man's heart may be weak, or the other organs of his body in such a poor state that when put to the severe test of a long march in tropical weather, and under service conditions, he fails to stand the test.

[Note.—This article has been written by an ex-soldier; it is based on an experience of nineteen years in the ranks. It is intended for the instruction of young soldiers.—Ed.]

I have often heard the remark expressed by old soldiers with experience of tropical countries in war and peace, that: "it is the finest-looking men who always go under the first"; and from what I have myself seen, I am inclined to believe there is some truth in the saying, for frequently have I seen big and well-developed men succumb to the severity of a long march, whilst apparently weak-looking men, of small proportions, have kept their places in the ranks, improving in condition day by day.

There is no surer method of finding out the weak spots in a man's physical armour than by hard and continuous marching during hot weather, and under service conditions. A march of a few days' duration is hardly sufficient; a man may accomplish this by a kind of spurt, which may last out the period yet leave him unfit for a further call.

It is when a week or two have been passed in continuous marching that the exertion begins to tell. Men who may have had to leave the ranks owing to trifling matters, such as sore feet, have returned to their places, and, if their general health and condition has not been weakened by previous excesses in their manner of living, by immoderation, and by neglect of exercise, they will go on improving in health and condition as the march continues.

I have usually found that the men who were least affected by excessive marching were also the men who invariably escaped contagion from the diseases prevalent during a campaign. The fact of their ability to endure continual marching was proof of their perfect health and condition, so that the resisting power of their system against the attacks of disease was naturally stronger than that possessed by men who could not withstand the fatigue of marching. That is why I consider marching as the grand test of a man's physical fitness.

I have heard the opinion expressed that a long period in the saddle is more distressing than marching on foot. This, however, I have reason to believe, is only the mounted man's way of consoling his less fortunate comrade of the line who has to trudge through the dust on foot, carrying his service load, whilst the former rides unhampered in front, or on the flanks. Nearly the whole of my own regiment, after eighteen months' almost continuous marching on foot during the South African War, became mounted, and though they still continued on the march acting as a mobile column for the remaining fourteen months of the campaign, I do not remember hearing a man say he regretted that he was mounted.

It is in the power of any man who has passed the medical examination which a recruit undergoes, to decide as to whether he is going to retain his health and increase his strength, or allow it to deteriorate.

Physical culture has many devotees in these days. There is one golden rule, however, which all who wish to secure and retain health and strength should follow, that is, be moderate in all things.

Excessive exercise, especially when taken with the sole desire of adding muscle to the body, does more harm than good. Exercise should be taken with a view to improving the condition of the various organs of the body, such as the heart and lungs, as well as strengthening the muscles.

To effect this end open-air exercise is an absolute necessity. This need not be of a violent nature. Some men are not constituted by Nature for indulging in violent exercise, or taking part in games such as football, cricket, hockey, &c. Whilst I am a firm believer in the physical benefit accruing to those who indulge in open-air games of all sorts in moderation, I believe it is still possible to keep in good health and perfect physical condition without participating in games at all.

A few hours of each day devoted to walking—which is the best of all health-sustaining exercises—and from ten to fifteen minutes' practice with light dumb-bells, part of the time being devoted to breathing exercises, is quite sufficient to keep one, who is disinclined or unfitted for rough games, in good physical and healthy condition.

Walking, however, to be of any hygienic benefit, should be of the brisk order. A shambling, aimless walk, is of no benefit whatever. When walking for health, the route should be decided on before starting, and the ground covered in a reasonable time. It is better to cover short distances at a quick and smart pace than to amble aimlessly on at a slow pace without any halts.

The route should not be selected with a view to avoiding hills. An occasional hill climb is beneficial to health, and if we get into the habit of halting on the summit of a hill to view the surrounding country, we are not only benefiting our general health, but also assisting to retain our range of vision. Defective eyesight is rarely met with amongst people who live in hilly localities, or where the clearness of the air makes an extensive view of country possible.

This may be one of the reasons why so many young town dwellers of the present day suffer from defective eyesight. In

large towns the child's daily range of vision is usually limited to the corners of the street it lives in or the back yard of its parents' house; that is, for the short period of daylight remaining between school hours.

Those who oppose the teaching of rifle shooting in schools, in their unreasoning opposition to anything appertaining to militarism —as they call it—overlook or apparently fail to see the benefit that rifle shooting might be to young people. If boys were taken out once or twice a week beyond the confines of the town and practised in judging distances and shooting, it would go a long way towards minimizing the effects of studying in artificial lights in school and the limited range of their playgrounds and streets.

The drill routine of the barrack square, with its regularity and variety of exercise, is of the utmost physical value to the recruit, and quite sufficient in itself even if no other exercise be taken. It is, however, when the recruit is dismissed his drills and becomes a trained soldier, when the drills are less frequent, and the enthusiasm for the same has somewhat diminished, that other means of keeping in physical condition are necessary.

Over-indulgence in athletics and excessive training, with the object of breaking or establishing records, or of securing prizes in athletic sports, too often ends in physical breakdown in middle-age, just when a man should be at his best. How often does one meet men between the ages of 30 and 40 who are complete physical wrecks, yet in their earlier years these same men were splendid athletes and winners of numerous prizes.

Next in importance to exercise is the matter of diet. Like the various systems of physical culture advocated nowadays, the food faddists are as numerous as their methods of dieting are varied. Almost every article of diet in use at the present day is either held to be dangerous to health and of no use whatever in sustaining the bodily strength, or it is hailed as the one article of diet necessary to keep the body in condition.

The question of meat eating seems to be the one object on which the various cliques of food cranks are united. They all agree in condemning meat as a useless, unnecessary, and even dangerous, article of diet, attributing to it most of the ills the human frame is subject to. Whilst, however, vegetarians are so bitter against meat eaters, it seems curious that vegetarian restaurants should serve up dishes most of which are set forth on their bills of fare as imitations of various meat dishes. On the principle of "Imitation being the sincerest form of flattery," this

alone should be evidence of the value of a flesh diet, or why should the vegetarians strive so much to imitate it?

The greatest triumph of vegetarian culinary art was recently accomplished in a London restaurant, where a vegetarian Christmas dinner was given in which the imitations of roast turkey, goose, and other flesh dishes were so perfect that the difference could scarcely be noted.

The solution of the diet question, as in all other things, lies in moderation. Many of the ills attributed to meat eating should really be placed to *excessive* meat eating. A mixed diet of meat, vegetables, grain and fruit is the most suitable and effective diet for all healthy people who wish to maintain their health and strength.

The soldier's present-day diet, with its variety and proportion of meat, vegetables and grain, and, above all, the regularity of the meals during peace time, is about the most effective body-sustaining system of dieting possible.

While it is advisable to avoid preserved or potted meats, it is not necessary to be over cautious. When in health, and leading an outdoor life, one can eat almost anything in the way of food without feeling any ill results.

In the matter of alcohol drinking, the virtue of moderation, whilst being the hardest to carry out, is nevertheless the most important matter to which the doctrine should be applied and practised. According to some of our highest medical authorities, alcohol in any form is not only absolutely unnecessary, either as a medicine or as a means of keeping the body in health, but it is also harmful even when used in strict moderation.

Sir Frederick Treves, when speaking of the Ladysmith Relief Force, remarked that "those who fell out on the line of march were not the tall men, the short men, the stout or the thin men, but the men who drank; drink was written plainly on the faces of the majority of the stragglers." For the sake of the temperance cause it seems a pity to question this statement, but from my own experience of that march—which, by the way, in the matter of marching was nothing in comparison with the duration and severity of the marches I took part in after the Relief of Ladysmith—I am unable to confirm this opinion. The high proportion of casualties on the march during our early marches in Natal was due principally to want of condition, owing to long confinement on board ship, and overloading, for it took some time to find out the personal kit a soldier could do without on service,

with the consequence that the men were overweighted with a lot of unnecessary articles, which were dispensed with later on.

I was familiar with the drinking habits of a good number of my own regiment, and amongst those whom I saw fall out on the march were the hard drinker, the moderate drinker, and the teetotaler; the latter more in proportion than either of the others. The men who kept their places in the ranks were those who previously had led a life of moderation and regularity in exercise, eating, drinking, and all other things, and had not weakened their constitutions either by debauchery, excess, or neglect of the ordinary rules of health.

The soldier abstainer is not always a conspicuous example of moderation in other directions, and I am afraid that if statistics could be compiled showing the resisting power to diseases, such as enteric and dysentery, of total abstainers and drinkers during the South African War, it would be found that there were more cases in proportion amongst abstainers than amongst those who were not.

Whilst admitting that it is quite right and proper that those who, either through hereditary taint or lack of self-control, find it impossible to avoid drinking to excess, should abstain altogether from its use, I do not believe that alcohol when taken in moderation can be harmful, though it may not be an absolute necessity.

Soldiers are not, as a rule, given much to spirit drinking; beer is their favourite drink, and good beer is — despite what the temperance party may say—from a hygienic point of view more beneficial than bad water, strong or wrongly made tea, or cheap minerals.

The harm caused by beer drinking, if it is not due to excess, may be attributed more to bad or adulterated beer than to the beer itself. It is advisable, therefore, to use only the regimental or garrison canteen, where the beer can generally be relied upon to be pure. Public houses in garrison towns, especially those usually patronized by the soldiers, and where there are generally other attractions provided, I have always found sell the worst description of beer. Avoid these houses, or drink as little as possible of their beer, and none whatever of their spirits. A good rule to follow is to note the brewer who supplies the beer to whatever house you may use, and when one is found in which the beer is good, use only the houses which sell that brewer's beer. By using the one brand of beer you can invariably tell by its condition whether the landlord has been adulterating it or not.

The Japanese Army has been hailed as an example of what can be endured by an army of abstainers. As a matter of fact, however, the Japanese Army was more an army of moderate drinkers than abstainers. During the Manchurian campaign alcoholic drinks were sold to the troops in their canteens whenever possible, though they were absolutely forbidden to purchase any drink outside their camps. Again, the troops received a periodical ration of *saké* or rice wine, the national drink of Japan, on the same principle as the rum ration issued to British troops in the field.

It is hardly necessary to dwell on the importance of cleanliness of the body as an essential condition for the maintenance of good health. Soldiers as a class are given to the observance of this rule, but unfortunately the means of carrying it out are not always available in barracks or camp, especially during the winter months.

Hygiene of the mouth, however, is a matter the importance of which cannot be overestimated. The possession of a good set of teeth is the finest asset for the preservation of health; whilst decayed or neglected teeth are frequently the main cause of many ailments.

To keep the teeth in condition they should be cleaned morning and night. No tooth pastes should be used, especially those highly perfumed, as they usually contain substances injurious to the teeth. A little camphorated chalk or pure white soap may be used occasionally, but if the teeth are cleaned twice daily, water alone is sufficient. The teeth should be brushed up and down, not across the surface, and the mouth well rinsed with water.

The brush should be kept in a case free from the dust of the barrack-room, and left occasionally for a while in the sun on the window-sill.

Do not pick the teeth with toothpicks made from hard substances such as bone, or use pieces of wood, match ends, &c. Constantly picking the teeth after meals—which is sometimes done more from habit than actual necessity—wears the gums away, leaving openings between the teeth and causing them to become loose. When the teeth show signs of decay, consult a dentist and have them attended to before the trouble increases.

Good eyesight being an indispensable essential of military fitness, the care of the eyes also calls for a little attention on the part of the soldier. Do not injure the sight by reading in a bad light. Unfortunately the light in the barrack-room is not always good, and the strain on the eyesight is most severe. Avoid reading facing the light, whether natural or artificial; the light should fall

over the shoulder or sideways. The practice of reading whilst lying on the bed, with the light by day from the opposite direction through the window, or at night from the gas in the centre of the room, a common practice in the barrack-room, is also injurious to the sight.

Care should be taken when washing in public lavatories, or that of the barracks, to see that the basin is clean. The galvanized iron basins of the barrack lavatory, unless they are scrubbed frequently, usually retain a greasy scum on the inside. It is always safer, for the benefit of the eyes, to wash the face from the tap, and on no account use hot water, as it naturally loosens the accumulated impurities of the basin, and eye disorders are sometimes contagious and conveyed in this manner.

As with the eyes, so it is with the hearing. Much damage is frequently caused to the delicate organization of the ears, by picking them with hard substances, such as pieces of bent wire, hair pins, and even match ends. If there is an excessive accumulation of wax, it is better to leave the ears alone, and they may right themselves in a few days; or a little glycerine or vaseline applied to the earhole, may assist it. Should the trouble continue, it is better to see the doctor and have them syringed.

It would be thought unnecessary to warn soldiers against the use of patent medicines, pills, &c., but from my experience, soldiers may be counted as amongst the best customers of the makers of pills and patent medicines. They are, or were, even sold in the regimental canteens, and always had a ready sale, and not infrequently I have come across a soldier's photograph in the newspaper advertisements: "Cured of some extraordinary disease by somebody's blue pills or bile beans." These concoctions are usually taken for some fancied complaint. Soldiers are omnivorous readers, and even the perusal of patent medicine advertisements is sometimes indulged in when nothing else is at hand, or one is feeling out of sorts. Like J. K. J. in "Three Men in a Boat," they fancy they have in turn each complaint enumerated in the list that the particular pill or medicine is claimed as a cure for, bar "housemaid's knee."

The less drugs, pills or medicine taken into the system the better. If one leads a healthy, regular life, there should be no need for these; and it is time to resort to medicine when it is by the doctor's orders, and when under his treatment. When a strong purgative is taken for constipation, while giving temporary relief, it causes future trouble, and if a dose is taken every time

the bowels are constipated it interferes with their natural action. A large glass of cold water taken immediately after rising in the morning, will assist the action of the bowels.

It is a good rule, and one followed by many soldiers, to get into the habit of going to the latrine soon after breakfast every morning, whether the desire to go be felt or not. This will invariably be found to lead to a regularity of action of the bowels and the visits will seldom prove abortive.

I should like strongly to impress the importance of boiling all drinking water in barracks or camp. Like many other important matters, however, the facilities for carrying out this rule are not in the power of the individual, either in peace or war.

I have shown elsewhere how water might be boiled in the field. In barracks, there should be an earthenware or enamel jar fitted with a tap in each barrack-room, which should be kept supplied with boiled water from the cookhouse, or in the winter months the water could be boiled on the barrack-room fire. Besides minimizing the risks of contagion from impure water in barracks and during peace time, this would accustom the men to the practice, the great importance of which should be pointed out in the lectures on Hygiene and Sanitation, which by a recent Army order are to be periodically delivered to troops. During the South African Campaign, the greatest difficulty was experienced in inducing the men to boil their drinking water, even in the blockhouses and small posts, where every facility for doing so existed. This was probably due to their inability to appreciate the necessity for this course; they had never heard of it before, and thought of it only as an unnecessary and senseless proceeding.

There is one subject which, though the last to be dealt with, is, owing to its far-reaching and deplorable effect on physical efficiency, perhaps the most important of all. I allude to venereal diseases. Unlike other diseases, these cannot be guarded against or their effects diminished by a previous high standard of bodily health. Syphilis, once contracted, is likely to be as destructive in its effects on the healthiest of bodies as on one weakened by previous ill-health and neglect of hygienic laws.

For this reason no man who values his health so much as to follow out and obey these laws, should be so foolish as to risk the shattering for ever of that good health and physical condition which he has taken such pains to maintain. Should he, however, by lack of sufficient self-control, contract a venereal disease, he should abandon all idea of concealment and report himself to the

doctor at once. Many of the most deplorable effects of venereal diseases are due more to neglect, concealment, or bad treatment by quacks than to the disease itself.

Syphilis, the most virulent form of venereal disease, is not so formidable when taken in hand at once on the appearance of the primary symptoms, and, if properly treated, is not likely to develop those disfiguring and destructive secondary or tertiary symptoms which usually follow early neglect.

Cleanliness of living, with a due regard to hygienic laws, exercise, and the maintenance of a high standard of health, will not only benefit the soldier whilst serving, by insuring him almost certain immunity from many of the diseases prevalent in the countries he is likely to be called upon to serve in, but will also aid him to a great extent when he re-enters civil life. A man whose body has been weakened by irregularity of living, or by much illness, stands little chance in the struggle for existence. Many a man is unable to obtain employment through sheer physical inability to perform the work offered him, or, when he does, loses it again through illness.

Much illness during early years ages a man more than anything else; and premature old age is one of the greatest bars to either the keeping or seeking of employment.

That it is possible, by attention to hygienic laws and by keeping fit, to minimize the chances of contracting climatic diseases, and also insure ability to successfully endure the exposures and severe conditions likely to be incurred in a prolonged campaign, I am convinced by what I have seen performed by others.

In my own case, though in my early career in the service I was not particularly robust—in fact it was principally due to frequently being informed of this by comrades, and, no doubt, well-meant predictions that I would never be able to stand any hardships—that I began to pay attention to health and exercise. Thanks to this attention, I was enabled to attain nineteen years' service without once having to resort to hospital.

At that period I went with my regiment to take part in the South African War; and though I had three years' campaigning, and nearly the whole of the time on the march, mostly on foot and as a private soldier, on whom the brunt of the hardships of a campaign must necessarily fall, I was still able to keep a clear record of freedom from disease or admission to hospital, and suffered very little from sore feet or the other worries of long and severe marching.

(*To be continued.*)

United Services Medical Society.

THE MEDICAL SERVICE WITH LORD METHUEN'S FORCE DURING THE ADVANCE ON KIMBERLEY, 1899.

By Lieutenant-Colonel C. H. BURTCHAELL,
Royal Army Medical Corps.

This paper is the outcome of an invitation to bring before a meeting of the United Services Medical Society some practical example of the work and tactical dispositions of field medical units. The operations of the force under Lord Methuen's command, during the advance on Kimberley, 1899—the First Division South African Field Force—were selected as suitable for the purpose because: (1) that period was the only phase of the South African War in which a division, and later an augmented division, fought a series of actions with its medical service complete in numbers and composition in accordance with the scale laid down in war establishments of the day; (2) a number of incidents in the medical narrative of those operations sufficiently well indicate principles which must always apply in the working of the medical service in war irrespective of the exact composition or nomenclature of its field units, or the general tactical situations in which those units may be employed; (3) as a matter of purely Corps interest it appeared to be worth while to endeavour to bring into one record the scattered information and references relating to the work accomplished by the officers, non-commissioned officers and men of the Corps who at that time formed part of the First Division, and whose services met with approbation in many diverse quarters; (4) a more or less detailed narrative of this period of the South African War may induce others to put together the history of the work of the Medical Service in other actions in which the Corps did equally useful work.

The official account submitted during the War by Colonel E. Townsend, P.M.O. First Division, of the manner in which the wounded were disposed of from the fight at Belmont up to the action of Magersfontein forms the basis of this narrative. That account has already been published in the "Report on the Medical Arrangements in the South African War," by Surgeon-General Sir W. D. Wilson, K.C.M.G. Maps showing the position of the

medical units during the various actions have not previously been produced, and moreover, the work of the Regimental Medical Service has not been recorded. In order to verify or locate the exact positions occupied by medical units, and to obtain notes of incidents in connection with the Medical Service, of historical or personal interest, a number of officers were written to recently with the result that thirty-three officers of the Royal Army Medical Corps and Royal Navy Medical Service, including fourteen out of the eighteen officers who served with regimental units in the firing line, have contributed to, or confirmed the incidents about to be recorded.

Before relating the events during the advance from Orange River it is desirable to refer to (1) the change which has taken place in the organization of the field medical units since the South African War and (2) the developments on the Cape Town-Kimberley line before the concentration of Lord Methuen's force.

		FIELD AMBULANCE.									BEARER COMPANY AND FIELD HOSPITAL.						
		Rank and file	Buglers	Serjeants	Warrant officers	Quarter-masters	Medical officers				Medical officers	Quarter-masters	Warrant officers	Serjeants	Buglers	Rank and file	
Bearer Division (three bearer sub-divisions)		36	1	1			1	6									Bearer Company
		36	1	1			1	6	Stretchers	8	1			2		32	
		36	1	1			1	6									
		10						10	Amb. wagons	10						10	
									Collecting and Dressing Stn.		2		1	4	1	8	
	127	118	3	3			3				3		1	6	1	50	61
Tent Division (three tent sub-divisions)		15		4			2				2		1	3		14	Field Hospital
		15		4			2				2	1		4		13	
		17		2	1	1	2										
	65	47		10	1	1	6				4	1	1	7		27	40
	192	165	3	13	1	1	9				7	1	2	13	1	77	101

(1) *Changes which have taken place in the Organization of the Field Medical Units since the South African War.*

The above table gives the composition of the present field ambulance and of the old bearer company and field hospital. The

upper portion of the table shows the carrying capacity of the bearer division of a field ambulance and of a bearer company. It will be observed that the former has eighteen stretchers with six bearers each as compared to the eight stretchers with four bearers each of a bearer company. The number of ambulance wagons and personnel to accompany them is the same, but the carrying capacity of the ambulance wagon has been raised as regards lying-down cases from two to four. The bearer company had a definite personnel and equipment for the formation of a dressing-station and collecting-station. The bearer division of a field ambulance has, within itself, no such personnel, which when required has to be provided by a tent sub-division or portion of one. The lower part of the table shows the three tent sub-divisions of a field ambulance and the personnel of a field hospital divided into two. The division of a field hospital into two halves was recognized as a legitimate procedure when necessary. The point to note specially is, that a whole field hospital equals almost exactly two tent sub-divisions of a field ambulance, as it will then be easy to estimate how many tent sub-divisions would have been at work during the various actions to be described, if the present organization had been in existence. Taking the medical units as being in direct relation to the largest formations within a division, i.e., the infantry brigades, and leaving out for the moment the other organizations known collectively as divisional troops, we find that each of the two infantry brigades in the old division had attached to it a bearer company and a field hospital, and in addition to those four units there was one other field hospital available in the division which was known as the divisional troops field hospital.

The present division has three infantry brigades, and three field ambulances which are divisional troops and altogether independent of the brigades. When three brigades were brought together under the old system, as, for example, at the battle of Magersfontein, there were available three such organizations as that shown in the table under Bearer Company and Field Hospital and in addition the field hospital of the divisional troops. Consequently, if the bearer company personnel shown as the collecting station and dressing station be taken down to the blank space in the field hospital part of the table and the deficiency in the hospital (tent) portion of personnel be made up to the present standard from the divisional field hospital, it will be found that the personnel available in the field for hospital or "tent" purposes under the old and the new organizations is approximately the same. But

there has been a large increase in the strength of the divisional troops. So the present division, with the exception of the increase of bearers per stretcher, who are only partially trained men, is relatively weaker in field medical unit personnel than a division made up to a strength of three infantry brigades on the old system.

A collecting station[1] under the old organization was a point to which wounded were carried by stretcher-bearers of the bearer company and from which they were carried by ambulance wagons to the dressing station. A dressing station, where splints, &c., were fixed and restoratives administered, was a half-way house between the collecting station and the field hospital, which, in turn, was supposed to be able to treat and feed the wounded and provide for all their requirements until they were evacuated to the line of communication hospitals. When the field ambulance organization was introduced, the collecting station, as a defined point in the scheme for the removal of wounded from the field, disappeared. It has recently reappeared in the shape of an advanced dressing station, not for theoretical reasons, but because in the medical manœuvres of 1910, and in nearly all medical exercises in the field, the occasional necessity for some such post was obvious and the only difficulty was to find a suitable term for it.

One other point is worth mentioning. When the present field ambulances were made divisional units, under the direct command at all times of the officer commanding the R.A.M.C. in a division, many officers thought the arrangement a very bad one when compared with the old system of a bearer company and field hospital as brigade units under command of the brigade commander. But under the regulations relating to those units it was optional for a G.O.C. Division to detach them from their brigades and place them at the disposal of the P.M.O. should circumstances make that course desirable. As a matter of fact during all the actions to which this narrative refers the brigade bearer companies and field hospitals were controlled and directed altogether by the P.M.O. so long as fighting lasted and wounded had to be disposed of. This came about automatically in the ordinary course of the work to be done and not on account of the regulations mentioned above. When the wounded had been evacuated the units went back to their brigades. Generally speaking that arrangement had many advantages. It

[1] In the Prussian organization during the Franco-Prussian war, this station was known as the *Sammelplatz*, or furthest point to which it was expedient to bring ambulance wagons.

will be noticed later on that in the first march from Orange River all the medical units marched together, and at the battle of Belmont and the later actions they were in no way tied up under brigade or localized control.

(2) *Developments on the Cape Town-Kimberley line before the concentration of Lord Methuen's force.*

About the middle of September when it was decided to send detachments of troops to Kimberley, Orange River, and De Aar, the equipment of two field hospitals stored at Cape Town was drawn and divided into four sections afterwards known as Nos. 1 2, 3 and 4 Sections Cape Field Hospital. The personnel was provided by reinforcements of Royal Army Medical Corps which arrived at the Cape during September and partly by the Cape Medical Staff Corps. These sections were not moved from Cape Town until after war broke out.

On September 19, the headquarters and four companies of the Loyal North Lancashire Regiment, detachments of R.G.A., R.E., A.S.C., and Lieutenant C. J. O'Gorman with two serjeants and three privates R.A.M.C. went to Kimberley. The other half battalion of the Loyal North Lancashire Regiment and details and Captain D. D. Shanahan, one N.C.O. and one private R.A.M.C., went to Orange River. De Aar was occupied by a small force about the same time. The medical equipment for the Orange River force was as follows: One pair field medical panniers, one field medical companion, haversack and water-bottle, a box containing extra dressings, medicines and medical comforts, and one ambulance wagon with mules. No tents were provided, and no cooking arrangements were made for the sick. These if required were to be provided by the troops. There were practically no sick, and not a single case of illness was sent to the base prior to the concentration of Lord Methuen's force.

October 11.—The time allowed by President Kruger's ultimatum expired at 5 p.m.

October 14, Nos. 1, 2 and 3 Sections Cape Field Hospital, under Major H. P. Birch and Lieutenants G. B. Crisp and W. H. S. Nickerson, arrived at De Aar, where the garrison had been increased during the preceding few days.

October 14-15.—Railway and telegraph line destroyed North and South of Kimberley, and the garrison there cut off.

October 14-18.—The 9th Lancers arrived at Orange River from

India. As this regiment was equipped on the Indian scale,[1] Captain J. V. Forrest who was in medical charge had with him an assistant surgeon and a native ward servant.

October 15.—1st Northumberland Fusiliers arrived at Orange River from De Aar.

October 17.—No. 1 Section Cape Field Hospital arrived at Orange River: personnel, Major H. P. Birch, 1 W.O., 1 Serjeant, 9 rank and file, R.A.M.C. This was the first hospital of any kind at Orange River. It was established in a few small houses at the back of the railway station, and partly in tents. Beds were improvised out of wooden railway sleepers. There was an ample supply of blankets and medical comforts. The sick were few and the arrangements met all requirements.

October 20.—The South African Field force commenced to embark at Southampton (the Army Reserve was called out on October 7).

November 3.—Colonel Hall's Brigade 18th, 62nd, 75th Batteries Royal Field Artillery arrived at Orange River between October 28, and November 3.

November 4.—No. 2 Section Cape Field Hospital which had been sent to Naauwpoort on October 27, returned to De Aar and there joined No. 4 Section, which arrived at De Aar from Cape Town on October 23. No. 3 Section went to Stormberg on October 27, and did not again return to the western line of rail.

November 6.—Reconnaissance from Orange River towards Belmont by 9th Lancers, 2 Companies M.I. (Northumberland Fusiliers and Loyal North Lancashire Regiment), 2 guns, R.F.A. Medical arrangements.—Captains J. V. Forrest and D. D. Shanahan, R.A.M.C.; four stretcher squads M.I.; two ambulance wagons with wagon orderlies; regimental medical equipment and medical comforts carried in ambulance wagon. The stretcher squads were the only dismounted troops. They were carried in the ambulance wagons, but as the pace was fast and the roads and tracks bad, the mules were completely done up from the heavy weight they had to drag. No casualties.

November 9.—A reconnaissance was made with the same force beyond Belmont to the vicinity of Enslin. Several railway culverts

[1] Several of the squadron stretcher-bearers had been employed on hospital duties in India and were very useful, especially during the later stages of the war when the subordinate medical personnel with mounted columns was very meagre. They were often left alone in charge of wounded at farms, &c., until the wounded could be removed.

were found destroyed. There was no opposition. The force bivouacked near Witteputs. The same medical arrangements were made, but on this occasion the stretcher-bearers were *mounted*, No. 4 carrying the stretcher in a rifle bucket. On the morning of the 10th the enemy, with guns, were met east of Belmont. One officer was killed; three officers (one fatally) and four men were wounded. When in touch with the Boers, the stretcher-bearers dismounted—No. 4 held the horses, and the three other bearers, with a stretcher, kept in touch with the troops. The wounded were carried in the ambulance wagons to the railway, and sent back to Orange River in a train which had brought out reinforcements. The floor of the truck in which the wounded were placed was covered with heather, which made a soft, springy mattress.

Concentration at Orange River.

On November 9 Lord Methuen, with the headquarters of the 1st Division, First Army Corps, disembarked at Cape Town, and the transports of the Army Corps began to arrive. Owing to the situation in Natal the 2nd Infantry Brigade and the artillery of the First Division were sent on to Durban, and the Guards Brigade, with its field hospital and bearer company, and the Field Hospital of the Divisional Troops, alone remained. Lord Methuen received instructions to organize a new brigade from the infantry battalions already at De Aar and Orange River, and, when ready, to advance rapidly on Kimberley. The 18th, 62nd, and 75th Batteries R.F.A. at De Aar and Orange River were to take the place of his original divisional artillery sent to Natal. This rearrangement of troops naturally caused a general upset in the mobilization allotment of medical units.

On November 12 Lord Methuen arrived at Orange River, and began to organize his force. The new 9th Brigade was formed by the 1st Northumberland Fusiliers, 2nd Northamptonshire, 2nd King's Own Yorkshire Light Infantry, and half of the 1st Loyal North Lancashire Regiment. The Divisional Field Hospital, First Division (Major F. A. Harris) was allotted to this brigade, and a bearer company was provided by withdrawing No. 3 Bearer Company (Major R. G. Hanley) from the Highland Brigade, which was concentrating about De Aar and was not required immediately to take the field. The Divisional Field Hospital thus diverted to what was considered the more important position in the force was replaced by Nos. 2 and 4 Sections of the Cape Field Hospitals, under Major

Greenway, R.A.M.C., and Surgeon-Major J. H. Cox, C.M.S.C., which had been doing the work of a local temporary hospital at De Aar. This field hospital only accompanied the division on the advance as far as Fincham's, where No. 10 Field Hospital (originally mobilized for the Highland Brigade) joined and became the Divisional Field Hospital, First Division. The sections of the Cape Field Hospital then returned (November 22) to Orange River. The medical units withdrawn from the Highland Brigade were replaced by a bearer company manned by the Cape Volunteer Medical Staff Corps under Lieutenant-Colonel E. B. Hartley, V.C., Cape Mounted Rifles, and by the field hospital originally allotted as the Divisional Field Hospital, Second Division. That division was then given the field hospital for Corps Troops, First Army Corps.

No. 3 Bearer Company, which became the 9th Brigade Bearer Company, arrived without its ambulance wagons, which were not embarked on the same transport as the personnel. It had to be fitted out at Orange River with buck wagons converted into ambulance wagons, and it started with only three fully equipped ambulance wagons which were with the regimental units at Orange River before the concentration.

To provide medical officers for the infantry of the 9th Brigade, Captain D. D. Shanahan was posted to the Northumberland Fusiliers; Lieutenant Crisp, from No. 2 Section Cape Field Hospital, to the Yorkshire Light Infantry; and Lieutenant W. Jagger was sent up from No. 1 General Hospital at Wynberg for the half battalion Loyal North Lancashire Regiment. Lieutenant E. L. Munn came out from England with the 2nd Battalion Northamptonshire Regiment, which was one of the battalions mobilized for the line of communication of the Army Corps.

Lieutenant A. H. Benson, Militia Medical Staff Corps, arrived from Cape Town, and was posted to No. 1 Section, Cape Field Hospital, at Orange River.

During the concentration period all regimental stretcher-bearers were instructed daily in first aid.

Commanding officers were directed to ascertain that all officers and men were in possession of a first field dressing.

Officers in medical charge of regimental units were directed to report any deficiencies in stretcher-bearers, stretchers, or medical equipment, and that their units were in possession of field hospital supply cases, i.e., regimental medical comforts.

Divisional orders were published directing that all bright parts of swords (not blades), bayonets, scabbards, and buttons were to

be painted or coloured khaki, and that officers were to be equipped like the men—the equipment to be obtained from casualties. Some of the Royal Army Medical Corps officers with regimental units, who, under this order, wore the regulation equipment, found the pouches useful for carrying an extra supply of bandages.

On November 19, when the general preparations were almost complete, a medical inspection of all officers, N.C.O.s and men was held. Medical officers were directed to take this opportunity to see that everyone was in possession of a first field dressing.

On November 20, the Division was ready, and the troops which had not already done so moved into bivouac on the north side of the Orange River.

Transport was provided for two blankets and one waterproof sheet per officer, and one blanket and half a waterproof sheet per man. No other personal luggage was allowed.

Tents were not to be carried, but field hospitals were allowed half scale for sick, i.e., 13 C.T.D. 112 lb. and 3 C.T.S. 80 lb. tents. Bearer companies and field hospitals also took operating tents.

Arrangements were made to send by rail, when feasible, the full scale of baggage and tents.

Advance from Orange River.

On November 21, the Division[1] marched at 4.30 a.m. in two lines to Fincham's Farm :—

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[1] The Brigades and Divisional Troops were composed of the following units :—

1st or Guards Brigade.	*9th Brigade.*
3rd Grenadier Guards.	1st Northumberland Fusiliers.
1st Coldstream* Guards.	½ 1st Loyal North Lancashire.
2nd Coldstream Guards.	2nd Northamptonshire.
1st Scots Guards.	2nd King's Own Yorkshire L.I.
Detachment A.S.C.	Detachment A.S.C.
Bearer Company.	Bearer Company.
Field Hospital.	Field Hospital.

Divisional Troops.

9th Lancers.	18th and 75th Batteries, R.F.A.
2½ Companies, M.I.	7th and 11th Companies, R.E.
Detachment New South Wales Lancers.	Rimington's Guides
Detachment A.S.C.	

Field Hospital.

* 1st Coldstream Guards did not join until the evening of the 22nd.
† 62nd Battery R.F.A. joined during the battle of Modder River.

(1) 9th Lancers, Guards Brigade, 9th Brigade, one company Royal Munster Fusiliers, along the railway line.

(2) The Royal Field Artillery and the S.A.A. carts of the brigades, 2 Bearer Companies, 3 Field Hospitals, Supply and Ammunition Columns, on the Hopetown-Witteputs Road. Distance about 9 miles.

The camping ground was a very good one, with an excellent water supply in a reservoir filled from a well. Owing to information which gave rise to a suspicion that the water supply on this line of advance might be poisoned with cyanide of potassium, the authorities at Cape Town supplied to certain units small tin cases containing the reagents and directions for the Prussian blue test. At Fincham's the Loyal North Lancashire Regiment received an alarming report that the water was poisoned, and Lieutenant Jagger was aroused from sleep and asked to test it. He had not heard of the box of reagents, so, with only visions of Prussian blue but with a definite knowledge of a possible sudden death, he realized the psychological moment of his career had come and that a physiological test was the only thing to save the battalion. He drank the water and retired to sleep.

November 22.—Lord Methuen, accompanied by his Staff, Infantry Brigade Commanders, the C.R.A., C.R.E., the P.M.O. and his secretary, started from Fincham's at 4 a.m. and reconnoitred the enemy's position at Belmont from the top of a kopje close to Thomas's Farm. The General having decided on his plan of attack, Thomas's Farm was noted as a suitable site for field hospitals. Leaving the mounted infantry to hold the ground in the vicinity of the farm, the Staff returned, and arrived at Fincham's at 8 a.m. It was during this reconnaissance that Lord Methuen named the prominent features of the Belmont kopjes, Table Mountain, Mount Blanc, and Sugar Loaf.

About 9 a.m. the enemy opened fire on the mounted infantry round Belmont, and early in the afternoon brought two guns into action. These guns were withdrawn on coming under fire from the 18th Battery R.F.A., which had moved up rapidly from Fincham's. Two men were slightly wounded. They returned to duty after their wounds had been dressed by Major H. L. Battersby, in medical charge R.F.A.

Orders for the attack on the 23rd were issued during the day. The Division moved at 4.30 p.m. to Thomas's Farm, where the head of the column arrived at dusk, but the rear guard with two ambulance wagons, under Lieutenant Fell, did not get in till 9 p.m.

The area available for the bivouac was small, and the medical units, in common with others, had difficulty in finding their places in the dark.

The Naval Brigade, consisting of 18 officers, 384 other ranks with 4 naval 12-pounder guns, joined the Division in the afternoon. Its medical establishment was 3 medical officers, 3 sick berth attendants, 10 stretchers with 40 stokers as bearers. These stokers were picked men from various ships who had been instructed at the Cape in stretcher drill and first aid by Fleet Surgeon J. Porter. The stretcher squads were equipped with field surgical haversacks and a Naval field chest.

Battle of Belmont, November 23, 1899.

At 2 a.m. the troops were preparing to move from their bivouacs. The Guards Brigade passed the Ganger's Hut about 3.20 a.m., the advance of the 3rd Grenadier Guards and Scots Guards being directed towards Gun Hill. The 9th Brigade crossed the railway line near the station, a little later, the leading battalions, the Northumberland Fusiliers and Northamptons being directed towards Table Mountain. Just as day was breaking and when the firing lines of the Scots Guards and Grenadier Guards were close to the points of attack, as shown on the map, the enemy opened fire all along the line. Many casualties occurred in the first few minutes, some bullets passing over the leading companies and catching those in rear.

Within 25 minutes the Guards had captured Grenadier Hill and very shortly afterwards the 9th Brigade were in possession of the western crest of Table Mountain. The enemy held on to the far side of that hill for some time and also kept up a fire from Mount Blanc. The Naval guns and R.F.A. shelled that point. Eventually both brigades crossed the valley to the east of Table Mountain. The 1st Coldstream Guards, supported by half the 2nd Coldstream Guards, captured the Razor Back. By 6.10 a.m. the last height was cleared and the enemy's laager was seen trekking away in a north-easterly direction. By 10.30 a.m. the fighting troops were back in the camp at the farm.

The total casualties were :—

	Killed	Wounded	Total
Officers	3	25	28
Other ranks.. ..	50	220	270
	53	245	298

The strength of the troops engaged was about 8,693.

Twenty-two wounded Boers were picked up on the kopjes.

The Grenadier Guards suffered the heaviest loss: 1 officer and 21 men killed, 8 officers and 106 men wounded. The Scots Guards lost 10 killed and 33 wounded, and the Northumberland Fusiliers 12 (2 officers) killed, and 40 wounded.

Regimental Medical Service.—The following description by Captain Profeit, in medical charge of the Grenadier Guards, is more or less typical of what occurred in the other battalions that came under severe fire:

"When orders were received on the 22nd that an attack was to be made on the Belmont position at dawn on the 23rd, I saw that all the medical equipment was packed in the Scotch cart, and the driver placed under my orders. The stretcher-bearers were served out with S.B. armlets and told that as soon as the battalion crossed the railway line they were to remove the stretchers from the cart and fall in. The field companion was to be carried by the corporal, the surgical haversack by another orderly, and the water-bottles by the men in charge of particular stretchers.

"About 3.30 a.m. on the 23rd we moved towards the position, the Scotch cart keeping in close touch with the battalion. When the railway line was crossed the bearers took the stretchers from the cart and fell in under me. Very soon we were over a slight rise in the ground and the Boers at once opened fire, the whole range of kopjes to the left front and right flank seemed alive with fire. Many bullets were flying about, so the stretcher squads were extended and moved up behind the battalion. As the attack developed they further extended to search for wounded and to render first aid. There were many casualties about a thousand yards from Grenadier Hill, which kept me busy till the firing slackened. The orderly corporal remained with me, and I attended to the most severely wounded men, attaching tallies and noting the position and severity of the wounds. Soon, however, I had news that there were a large number of wounded lying under Grenadier Hill. When I got there men seemed to be lying about in scores, and it looked as if there was work for half a dozen medical officers. However, I set to work and rendered what aid I could, applying tourniquets and using up all the dressings in the field companion, and as many first field dressings as could be found. As I tied up the wounds the corporal jotted down on the tallies the kind of wound, and if a tourniquet had been applied. This went on until we had done about twenty cases, then the work

and hurry to get the men off the field necessitated this regulation being given up, and the corporal was sent to render first aid himself, and give many who were shouting for it a drink of water. Writing notes about cases on the field is a waste of time where large numbers of men have to be dealt with, and even attaching different coloured tallies to signify the severity of the wound had much better be done in the dressing stations.

"The two essentials most vividly impressed on my mind were the relief of pain and thirst. Luckily we had plenty of water in the water-bottles to give a sip to those who most needed it. A 2-oz. bottle of morphia solution and a good hypodermic syringe are invaluable.

"Later the bearer company, under Captain Beach, came up with some wagons and began to clear the field near Grenadier Hill. As I was not required he asked me to get on my pony and see if the Coldstream Guards had many wounded, and to tell the medical officers with those battalions that wagons were on their way to remove their wounded. As soon as I had done this, I went back to the bivouac, and then on to the field hospital at Thomas's Farm, where I worked for some hours among the cases there."

When the 1st Battalion Coldstream Guards was extended to attack the Razor Back, a staff officer rode up to Captain Hooper, R.A.M.C., and requested him to send all the regimental bearers to Grenadier Hill. They were sent, and Captain Hooper, with the regimental medical corporal, alone dealt with the casualties in the battalion (nine killed and nineteen wounded), which were later taken over by the Guards Brigade Bearer Company. Three wounded Boers were found near Kaffir's Kop Farm, one a compound fracture of the thigh; two had been dressed by their own side.

Colonel Gough's force, consisting of two squadrons 9th Lancers and some mounted infantry, moved out at 4 a.m., crossed the railway line north of Belmont Station, and advanced at a gallop in an easterly direction. They were soon checked by a strong party of Boers and suffered three or four casualties. These were carried by the regimental bearers to cover under the railway embankment, and Captain J. V. Forrest, R.A.M.C., in medical charge 9th Lancers, sent a mounted orderly to the station for an ambulance wagon. Moving north this force overtook two Boer ox ambulance wagons with two doctors[1] and some sick attendants, but no patients. They were

[1] One of these doctors was an Edinburgh graduate who had served in the Volunteers and was a contemporary of Captain Forrest.

brought back to Belmont but allowed to go soon afterwards. Some wounded mounted infantry were brought in on these Boer ambulance wagons.

The Assistant Surgeon of the 9th Lancers accompanied the mounted troops which went round to the south of the position. There were no casualties.

Medical Units.—All the medical units received verbal instructions[1] from the P.M.O. on the evening of the 22nd as to the general dispositions to be adopted during the fight. The bearer companies were to follow their brigades. The Guards and 9th Brigade Field Hospitals were to open at Thomas's Farm, and the Divisional Field Hospital to stand fast in reserve in the vicinity of the farm.

The 9th Brigade Field Hospital bivouacked at the farm on the night of the 22nd, but the Guards Field Hospital, unable to reach it that evening, owing to darkness and the congested state of the tracks leading to it, did not arrive there until early morning on the 23rd. Both units made all preparations to receive wounded, while the troops were moving out to the attack.

Bearer Companies.—The Guards Brigade Bearer Company followed the brigade to the junction of the road between Thomas's Farm and the Ganger's Hut, and there halted. Directly firing began the whole unit moved to the railway line. The ambulance wagons were unable to cross until a party from the railway construction train came up and filled in some ditches on each side of the line, but the stretcher squads, under Captain Beach and Lieutenant Hodgson, followed the troops. A dressing station was opened at the Ganger's Hut and a collecting station established near the southern point of Grenadier Hill. A good many wounded walked back to the dressing station. The ambulance wagons were at first used between the collecting station, and other positions on the field, and the dressing station. When about thirty wounded were collected at the latter, half of the ambulance wagons were used for conveying them to the field hospitals. Cases which were satisfactorily dressed and did not require further attention at the dressing station were sent straight on to Thomas's Farm.

The 9th Brigade Bearer Company moved off behind the rear battalion of the brigade and halted on the road leading from the farm to the railway station. When Grenadier Hill was captured the enemy were still holding on to some points on the left of their

[1] On the 22nd the Brigade Major 9th Brigade by means of a rough sketch explained to the officers of the bearer company of that brigade the general plan of attack.

position, which made any movement of medical units on that flank unsafe. Colonel Townsend, therefore, ordered (by mounted officer) two ambulance wagons and two stretcher squads to move on to the field via the Ganger's Hut. This party set up a collecting station west of Gun Hill. Shortly afterwards, when the road was safe, the remainder of the bearer company moved up to Belmont railway station, and there opened a dressing station which received wounded from that collecting station and direct from the field. At first wounded were sent from the railway station to the field hospitals at the farm, but, about 8 a.m., when it was evident that there was no danger of a counter attack from the north, the Divisional Field Hospital was ordered to open at the station and take over the wounded already there and those coming in from the field. There was a track fit for wagons from the station to Gun Hill.

Field Hospitals.—At the station, the goods shed, which held about 20 cases on stretchers, and the verandah on the platform were used to accommodate wounded.

At the farm several small rooms were available, and also an adjoining school-house ; some of the rooms were used for wounded officers, and one was arranged as an operating room. The first casualties to reach the farm were slightly wounded men, who walked back from the fight and arrived there about 7 a.m. Subsequently, ambulance wagons arrived in rapid succession from the Ganger's Hut and from the railway station. All the field hospital store wagons were off-loaded and sent out to assist in carrying wounded. By 1 p.m. 253 wounded were in the field hospitals, 172 at the farm, and 81 at the station (59 British and 22 Boers). Amongst these there were 14 officers, including Major-General R. S. R. Fetherstonhaugh, commanding the 9th Brigade, at the farm, and one officer and Mr. E. F. Knight, the war correspondent of the *Morning Post*, at the station. Fifteen slightly wounded remained with their units and were not admitted to hospital. The officers of the bearer companies and some of the medical officers of regimental units assisted at the field hospitals which were at work throughout the afternoon and evening. The number of cases of fracture of the thigh was larger than in later actions. At the request of Surgeon-Lieutenant-Colonel Magill the Royal Engineers made a dozen long wooden thigh splints for the Guards Brigade Field Hospital. These splints were specially made thicker and broader than the usual thigh splint, and some of them not used at the time, proved very useful in subsequent engagements.

Several major operations were necessary, including two amputations of the thigh and one through the shoulder-joint.

Medical supplies to replace dressings expended during the day were wired for.

Geneva Convention.—Soon after the troops withdrew from the kopjes, a Boer wearing a Red Cross badge on his arm rode into the dressing station at Belmont Station. He said he had come to inquire how his wounded were getting on, and proceeded to go round the twenty odd cases (Boers) there. A signaller at the station, thinking the visitor was rather casual, signalled the incident to his chief. A reply came back directing the Boer to be brought to divisional headquarters. He was there interrogated and, although at first suspected of being a spy, he was eventually allowed to go. The circumstances are worth noting because the officer in charge of a dressing station or hospital should detain an unknown visitor from the enemy and communicate with the intelligence or other officer competent to deal with the matter.

November 24.—The wounded awaiting evacuation numbered 212 British and 20 Boers, total 232. Of the 253 admitted to the field hospitals 9 were discharged to duty, and 12, including 2 Boers, died.

No. 2 Ambulance Train (Captain C. C. Fleming, R.A.M.C.), which had been wired for and despatched from Cape Town at 2 p.m. on the 22nd, arrived at Belmont at 5.30 a.m. It was loaded during the morning with 5 officers and 107 others—British and Boers—all slight or less severe cases, and some sick. About 1 p.m. it started for Orange River. A wire was despatched notifying its departure and asking for stretcher-bearers to be in readiness to unload it. There was little unnecessary delay at Orange River and the train returned at once to Belmont, where it arrived at 8 p.m. The remaining wounded, nearly all serious cases, were waiting at the station laid out in rows on the platform and in the goods shed. The work of loading was slow and difficult owing to the darkness and the number of bad cases, such as fracture of the thigh, &c.; however, the train got away successfully soon after 10 p.m.—'line clear' for Wynberg. It took 14 officers and 106 others, total 120. There was only lying-down accommodation for 96, so there was serious overcrowding up to Orange River, where 18 of the least serious cases were dropped, and the train proceeded to Cape Town with 102 dangerously and severely wounded. One officer and 2 men (wounds of head, abdomen, and spine) died on board next day.

The Division, with the exception of the Scots Guards, two companies Royal Munster Fusiliers, the naval guns, and the

medical units, had moved on at 3 p.m. to Swinkpan, north-east of Belmont, and about 8 miles from Thomas's Farm.

Two ambulance (buck) wagons and two stretcher squads of the 9th Brigade Bearer Company, under Lieutenant Fell, R.A.M.C., accompanied the division, and the 9th Brigade Field Hospital, after handing over its wounded to the Divisional Field Hospital at Belmont Station for entraining, followed the division and reached Swinkpan two hours after dusk.

When the last of the wounded were disposed of, the Guards Brigade Field Hospital and Bearer Company bivouacked at the station with the Divisional Field Hospital and 9th Brigade Bearer Company, and Colonel Townsend decided to march with these units at 2 a.m., when the moon rose, to catch up the division. An earlier start he considered inadvisable as the night was very dark, there was no guide, and the mules, working all day carrying wounded to the station, were not outspanned until 9 p.m. and were already done up. It was after 11 p.m. when the personnel got to rest in their bivouacs after a hard day's work.

The enemy were located during the march of the division to Swinkpan, and about 9 p.m. the Chief Staff Officer told Lieutenant Fell that there would be a fight the next day, and gave him an order directing the officer commanding the 2nd Battalion Northamptonshire Regiment to provide blankets and men to act as stretcher-bearers in case the bearer companies did not arrive in time. Lord Methuen sent a note to Colonel Townsend, by a mounted messenger, asking him to send on blankets and stretchers as soon as possible. Colonel Townsend received this note about midnight. He detained the messenger, and at once issued orders for all the medical units to march from Belmont at 1 a.m.

At this stage of the campaign inspanning at night was a tedious proceeding, and on this occasion it took longer than was anticipated; however, the column was on the move at 1.30 a.m. It consisted of 17 officers, 182 other ranks, 40 vehicles, 20 horses, 310 mules, and a number of native drivers. The N.C.O.s and men were carried in the ambulance wagons. The night was very dark, the road was bad, and the guide, as usual, but slightly acquainted with it, led the convoy on to a wrong track with the result that an ambulance wagon full of men was upset when crossing some rough ground to regain the road.

The bivouac of the division was reached about 4 a.m. The advanced guard had already moved off. The water supply at Swinkpan consisted of two small dams, which contained more

mud than water, and an attempt to water the mules met with but little success, as what water there was many of the animals refused to drink. The result of this, and the difficulty of obtaining water for the water-carts, will be seen later on.

Action at Graspan, November 25, 1899.

The Lieutenant-General was greatly pleased at the prompt return of the medical units. He explained the situation and plan of action to the P.M.O. The Naval Brigade, supported by the 9th Brigade, was to attack the south-eastern end of the enemy's position on the Graspan-Rooilaagte kopjes. The Guards Brigade with all the baggage was to move towards the railway line at Enslin.

The advanced guard—Naval Brigade—moved off from Swinkpan at 3.30 a.m., followed by the 9th Brigade, with which went Lieutenant Fell's detachment of the bearer company and the 9th Brigade Field Hospital. The Guards Brigade Bearer Company and Field Hospital rejoined their brigade on arrival at Swinkpan, and the Divisional Field Hospital was ordered to follow the Guards Brigade to Enslin. The 9th Brigade Bearer Company moved on at once to catch up its brigade, which it did shortly before the assault on the kopjes.

The attacking troops were in touch with the enemy about 7 a.m. They had then been marching over three hours across rough ground, there was a scorching sun and the men were parched with thirst. The main attack was carried out and the position captured by the Naval Brigade, the Loyal North Lancashire Regiment and some companies of the Yorkshire Light Infantry. They were exposed to a very hot fire and cross fire from within 700 yards, and the frontal fire continued until 25 yards from the crest of the kopje. The Naval Brigade, which consisted of 10 officers, 190 Royal Marines, and 55 Bluejackets, lost 3 officers killed and 3 wounded (one mortally), 7 men killed and 86 wounded (four mortally). Nearly all the petty officers and N.C.O.s were either killed or wounded. Some who were wounded during the approach were struck again where they fell; some were able to crawl towards an ant-heap or tuft of grass; others when wounded struggled on. Lieutenant Jones, Royal Marine Light Infantry, hit in the thigh, continued to lead his men on to the top of the kopje. The Yorkshire Light Infantry lost 6 killed and 39 wounded, and the Loyal North Lancashire Regiment one killed and 20 wounded. The total casualties were:—

	Killed	Wounded	Total
Officers	3	6	9
Other ranks	14	162	176
	17	168	185

Of the above wounded, 5 were not admitted to hospital, 6 died in the field hospital, and 1 returned to duty in the field. The strength of the troops engaged was about 4,594.

The stretcher squads of the 9th Brigade Bearer Company, under Captain C. W. R. Healy, followed the attacking troops and established a collecting station 1,000 yards east of the point attacked by the Naval Brigade. The rest of that unit opened a dressing station one mile south of the collecting station. When the attack developed the 9th Brigade Field Hospital received orders from Colonel Townsend to proceed to Graspan Siding, and there get ready to receive the wounded and make preparations for entraining them so soon as an opportunity occurred. The wounded unable to walk were brought to the dressing station and sent on in ambulance wagons and off-loaded buck wagons to the field hospital throughout the day. The ambulance mules, after the previous day's work, the night march, the journey on to the field, the work in collecting the wounded and the want of water, were done to a turn, and by the afternoon many of them could hardly keep on their feet.

Consequently, when darkness came on there were still forty-four bad cases at the dressing station which could not be sent to the field hospital. These patients were made as comfortable as possible on stretchers and under cover of the operating tent. Owing to miscarriage of a message and the state of the mules, there was no water and very few rations available at the dressing station. Major Hanley, who was in charge of it, said that for many hours, not having a drop of clean water to dissolve the morphia tabloids for hypodermic injections, he had to place the tabloids under the men's tongues. All he had to supplement the bovril, milk and brandy were three tins of lunch biscuits, which he distributed among the wounded who were crying out for food during the night.

The enemy's guns were brought into action against the armoured train on the railway, and they also fired some shells at the Guards Brigade. This brigade was diverted towards the attack at one period of the day, but did not come into action. A party from the bearer company under Captain Beach helped at the collecting station. The enemy retreated after the capture of their main position, and the troops went into bivouac just north of the pan at Rooilaagte and to the west of Enslin Station—the

Divisional Field Hospital and Guards Brigade Bearer Company at the former, the Guards Brigade Field Hospital at the latter. There was a windlass and bucket well at Enslin with a very limited supply of good water.

A Boer hospital, established at a small house south of the high kopje south-east of Enslin Station, was captured. In it were thirty wounded Boers and a man of the Loyal North Lancashire Regiment who was wounded on the 23rd. There were also several Boer medical officers, some hospital attendants, a wagon filled with medical materials and a limber containing surgical and veterinary instruments.

The following accounts of the Regimental Medical Service during the fight and the work of the Field Hospital at Graspan Siding are interesting:—

Fleet-Surgeon Porter and the stoker bearers followed close in rear of the firing line and did their work under the hottest fire. From the top of the kopje (i.e., the point captured by the Naval Brigade) we could see the surgeons and their orderlies already moving amongst the wounded. Already the collecting place for wounded had been formed, and backwards and forwards toiled the stretcher-men in the terrible heat with their human burdens. Coming down, the men lent a hand in getting their messmates to the ambulance. Each man's cry was for water. One man mortally wounded and with one arm smashed, unable to pull out the stopper, had bitten off the metal neck of his water-bottle in the agony of thirst and pain.[1]

Lieutenant Walter Jagger, R.A.M.C., Loyal North Lancashire Regiment, described his experiences thus:—

"Having been detained behind when the companies were deploying I had to gallop along the line to get to the battalion. The firing at the moment became exceedingly furious, and my pony was shot. The stretcher-bearers were widely separated, and we had to leave the stretchers, and to apply the first field dressing as hard as we could go. There was absolutely no cover, and the stretcher-bearers were warned to exercise great caution when moving about to render first aid. We had to dress the casualties while lying down ourselves—the fire was very heavy. Immediately we moved we drew fire, and it was impossible for more than one man to go to their aid at a time; consequently we got scattered amongst the K.O.Y.L.I., Northumberland Fusiliers and Loyal North Lan-

[1] "The Naval Brigades in the South African War, 1899-1900," by Lieutenant W. T. C. Jones, Royal Marines.

cashires, dressing all we could. While splinting and dressing a compound fracture of thigh, I was hit through the haversack. An officer shot in the lung and thigh was unaware of the wound in the lung. I dressed many casualties on the kopje, then returned to help in loading the ambulance wagons of 9th Brigade Bearer Company until all were cleared. There were a few left when an officer with some mounted troops returned from the right flank. He warned us we were not safe as the enemy were near, and offered me an escort. This, of course, I refused (a practical point of great importance), as I knew I was safer without one. He had hardly gone before the enemy fired on us. Later I reported the incident to Lord Methuen. We were fired on from a Cape cart with a Red Cross flag which was going East from Rooilaagte. The Adjutant Loyal North Lancashire had lent me his pony to come in on. I started the last ambulance wagon and mounted to go, when the pony was shot through the shoulder just in front of my knee; I got off and led him back to bivouac dead lame."

Captain J. V. Forrest, R.A.M.C., gave the following narrative :—

"One squadron 9th Lancers and 2 companies M.I., went off north-west and I accompanied this party. My assistant surgeon went with the other party to the north-east. By a circuitous route we got on to the north side of the Boer position and took up a post in some hills about 3 miles south-west of Honey Nest Kloof Station overlooking the vast expanse of veldt which runs almost without a break down to the Modder River. From here we saw the Boer wagons inspan and trek off. We got into helio communication with the other squadrons which had gone north-east. Later, when a serious attempt was being made to cut off our line of retreat, we retired on our line of advance towards a small post formed earlier in the day to provide for this very contingency.

"A party of sharp-shooters who had crawled down under cover of the railway embankment accelerated matters, and I soon found myself helping a man with a fractured thigh off his horse. To avoid drawing fire, I sent my pony along with the stretcher-bearers and the squadron, and told the stretcher-bearers to come back when they could. Having extracted the Martini-Henry bullet from the inner side of the man's thigh, I fixed him up with the means at my disposal, using his lance as a long splint (the carbine being on the saddle and the horse gone). On looking up, I found that I was no longer alone, but in the direct line of retirement of a Boer commando. The advanced party was preparing to do a little snap-shooting, when an older warrior shouted out, 'Nit

schiessen' and in a few minutes I was surrounded by a large crowd examining a 'khaki' at close quarters for the first time. As I explained who I was, &c., to the field-cornet, I found the younger bloods were rapidly helping themselves to my spurs and leggings. They were however dropped like hot iron on my appealing to the field-cornet.

Their curiosity being satisfied, the retirement was continued in driblets. They told me that they had shot somebody else, and pointed over the vast plain, and said, "Somewhere about there." Leaving my friend lying, I picked up the monkey-box, and proceeded to search. Eventually I found my stretcher-bearers coming back to look for me. (They still carried their carbines and had had a little scrap on their own on the way.) We opened out to look for the other case, but had to give it up to find the first man again before it got dark. Some kind Boer, knowing how easy it is to miss a certain point on the vast veldt, had taken the lance off the man's thigh, and stuck it in the ground end up as a landmark; and had it not been for that, I should probably have lost him, too, for I noticed the lance well away on the flank of the direction in which we were moving. I had the thigh case carried to the railway line, and sent my orderly along the line into Graspan with a note to the nearest bearer company for an ambulance wagon. This man was not brought in till the following morning. The casualties with the other party were brought in by ambulance wagon sent on verbal requisition. We failed to find the other man next day."[1]

Field Hospital at Graspan Siding.—The 9th Brigade Field Hospital arrived at Graspan about 9 a.m., and opened close alongside the railway siding: Operation tent pitched and equipped; staff told off; kitchen got ready; latrines and refuse trenches dug; water-carts refilled from water-tanks, brought up the railway line on trucks. There was no water obtainable locally. The field hospital kitchen was improvised with two iron rails from the railway siding, and answered well, as coal was obtainable at the siding and from the locomotives; hot water was now and then obtainable from a locomotive.

At first only a few, but eventually all, hospital tents were pitched and equipped. There was a certain amount of overcrowding as only half scale of tents was carried.

The wounded were brought in by the bearer company ambulance

[1] The body was found by a patrol about three months later with wounds in the head and abdomen.

wagons and by off-loaded buck wagons of the field hospital which were sent out to the collecting station when it was seen that the ambulance wagons were not sufficient and that their mules were done up. Some empty supply wagons were also sent out by the A.S.C.

By nightfall, when darkness and the state of the mules prevented any further transport of wounded, there were 129 wounded British in the hospital and a few Boers.

There was no difficulty about rations for the wounded, as the field hospital carried two days' supply for its own personnel, and the supply column was within reach.

The disposal of the dead—brought in and died in hospital—was arranged for by the quartermaster (Captain J. W. H. Beach), who had graves dug by a working party, sent on application by one of the battalions. The field hospital picks and shovels were used. Boers were buried apart from British. The names of the dead and the position of the graves were noted. Captain Beach obtained a brief written form of burial service from a passing chaplain.

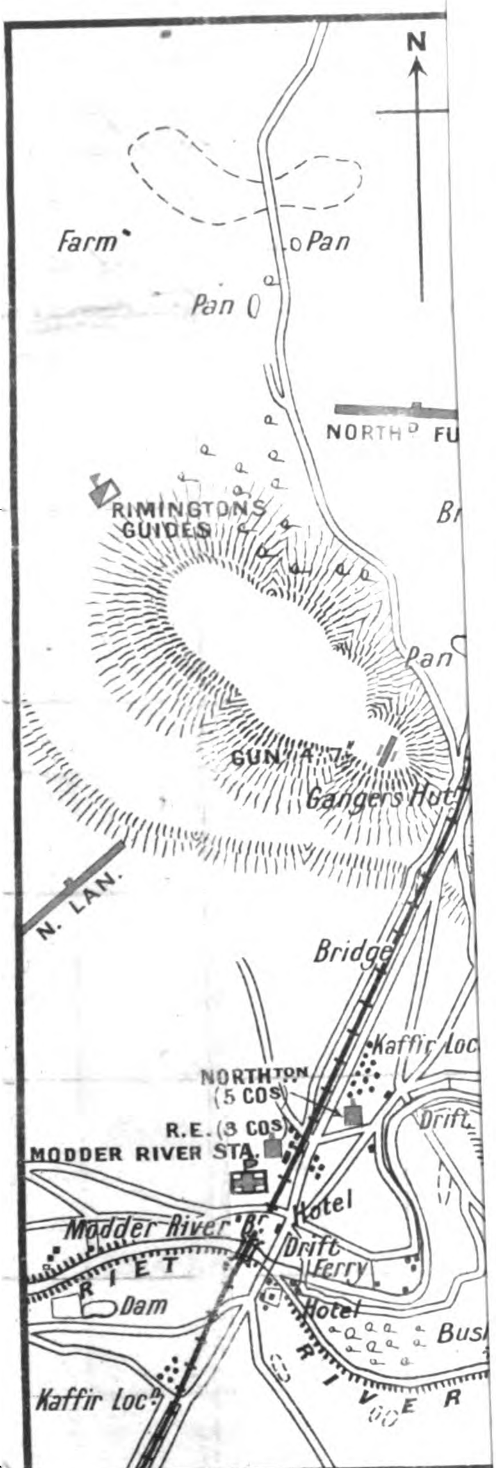
Sunday, November 26.—The division remained in bivouac at Enslin.

At 7 a.m. wagons sent to assist in removing the wounded still out on the field arrived at the dressing station. The last of the wounded were clear of the site by 9 a.m., and the 9th Brigade Bearer Company moved to Graspan Siding, where it remained until the afternoon, when, after assisting to load a train, it rejoined its brigade at Enslin.

A train composed of some specially arranged trucks, some open trucks and a few passenger coaches was brought to Graspan Siding early in the afternoon. About 10 sick and 30 wounded Boers found at Rooilaagte were loaded on trucks at Enslin and sent down to join the train, which was eventually loaded with a total of 107 patients—97 wounded, 62 British, 35 Boers—and 10 sick. The wounded were provided with blankets and rations and all water-bottles were filled. Captain J. C. Jameson and two privates, 9th Brigade Field Hospital, were placed in charge of the train, which started for Orange River at 8 p.m. Camp kettles, milk and beef-tea already prepared, a field medical companion and some dressings were put on board.

Owing to the composition of the train, Captain Jameson noted that it would be quite impossible for him to be of any assistance, except to those in his own carriage, without stopping the train.

Monday, November 27th.—At 4 a.m. the division moved from Enslin and marched about twelve miles to Witkoplaagte, seven



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miles south of the Modder River railway bridge. The Cavalry and Mounted Infantry reconnoitred in the direction of the Riet and Modder Rivers. Two men of Rimington's guides were wounded.

No. 3 ambulance train, Major M. W. Russell, R.A.M.C., was dispatched from Cape Town at 3 p.m. on November 25, and arrived at Graspan Siding about noon. This train was loaded up with the remaining wounded, five officers and eighty-nine others, and started for Cape Town at 3 p.m., but was detained on a Siding South of Graspan for two and a-half hours, while trains conveying the 1st Battalion Argyll and Sutherland Highlanders from Orange River to reinforce the division at Witkoplaagte were moving north. Two men died on board the ambulance train between Graspan and Orange River. The ambulance train brought up some medical supplies that had been telegraphed for after the Battle of Belmont. It also brought back from Orange River Captain Jameson and the men sent down in charge of wounded the previous day.

The 9th Brigade Field Hospital moved off from Graspan at 3.30 p.m., and went into bivouac for the night at Enslin Station, under cover of a post that had been established there when the division marched out.

(*Tc be continued.*)

Clinical and other Notes.

REPORT ON AN EPIDEMIC OF ENTERIC FEVER AT THE DEPOT OF THE ROYAL BERKS REGIMENT AT READING (DECEMBER, 1910, AND JANUARY, 1911.)

By Major E. C. HAYES.
Royal Army Medical Corps.

The data of the following report on the occurrence of a nest of five cases of enteric are epidemiologically interesting, and point a moral with regard to night urinal cleansing, and the necessity of inquiring into the care of these modern barrack conveniences.

The history of the epidemic, if such a term may be used of five cases, is as follows:—

(1) Private F., aged 18, 3rd Battalion, Royal Berks Regiment (Special Reserve), who enlisted on October 17, 1910, came to hospital on November 9, with a history of having been sick since October 26, i.e., ten days after enlistment. He developed enteric fever and was treated in the Royal Berks Civil Hospital. He proceeded direct from hospital on sick furlough on December 31, and was not therefore in barracks after November 9. He would appear, however, to have been probably excreting the *Bacillus typhosus* in barracks for a period of twenty-four days (October 17 to November 9), and it seems clear enough that he contracted the disease in civil life previous to enlistment at Challow, Berks. Inquiries were made by the Medical Officer of Health as to the occurrence of enteric fever at this place, but with a negative result.

(2) The second case in the series was Private R., aged 22, of the Royal Berks Regiment (Regulars), who reported sick from No. 3 room, Anson Block, on December 29, with a history of having been ill since December 22, on which date he went on Christmas leave till 28th. It would therefore appear probable that he had been excreting the *B. typhosus* in barracks for fourteen days before December 22, i.e., from December 10, the probable date of his infection (at this date he had been on pass to Abingdon for the day).

(3) The third case was Private C., aged 18, of the 3rd Royal Berks Regiment, who reported sick from No. 3 room, Anson Block, on December 30, with a history of having been unwell since the 23rd, when on Christmas leave, from which he returned December 28. The date of his infection would roughly be, therefore, December 11.

(4) The fourth case was Private L., aged 18, of the 3rd Battalion, Royal Berks Regiment, who reported sick from No 3 room, Anson Block, on January 1, 1911. He had been on Christmas leave from

December 22 to 28. (One of his comrades who was with him on leave states L. appeared quite well on December 26, 27, and 28). The probable date of infection in this case is not as clear as the first three. It is not unlikely that it was about the same.

(5) The fifth case was Corporal A., aged 29, of the Depot Staff, Royal Berks Regiment, who reported sick from No. 2 room, Anson Block, on January 4, with a history of having first felt ill on December 31. His probable date of infection would therefore appear to be the middle of December.

Remarks.—I visited the Royal Berks Depot at Reading on January 6.

A perusal of the Medical History Sheets of the entire garrison revealed no entry for a previous case of enteric fever or any condition likely to be mistaken for it. Inquiries from the recruits of the infected block as to such infection in civil life, showed that none of them had suffered from enteric fever for a period of five years. A "carrier" was not therefore the likely source of the present epidemic.

The water supply appeared to be above suspicion, besides the cases were limited to Nos. 2 and 3 rooms, Anson Block, out of a total of 12 rooms in barracks.

The Medical Officer of Health, Reading, informed me that the milk supply, which came from Tilehurst, was almost certainly not to blame. He, however, sent out his inspector to ascertain if any cases of enteric had occurred there.[1] The fact, however, that the barrack supply is, and has been in the past, invariably boiled, precludes this source of infection. The kitchen employees, one serjeant who is married and two old soldiers, were questioned, but I failed to trace any recent illness in either the serjeant's family, himself, or the other men.

A hawker is permitted in barracks, but he sells on percentage for the canteen; similar inquiries from him were negative.

Inquiries at the canteen and Army Temperance Association were also negative. The latrines are common to the rank and file of the whole barracks. They are modern pedestal w.c.s, and are not the source of infection, otherwise there would have been some cases amongst rooms other than Nos. 2 and 3.

It is different with regard to the night urinals. There is a separate modern night urinal to each room, in a recess off the ablution room outside each barrack room. They are quite modern, water flushed, and are made of glazed earthenware. Inquiries have revealed certain other facts. Thus in Nos. 2 and 3 rooms' urinals, the same mops or pieces of flannel had, contrary to orders, been used to clean down both the earthenware surfaces and floors of urinals, as well as the floors of the ablution rooms. It is quite possible that cases Nos. 1, 2, and 4, were employed in cleaning these urinals, and it is quite positive that No. 3 was so employed. A sinister fact is that the pieces of flannel employed were also used for cleaning the

[1] I subsequently received a negative report on this point.

barrack tables, &c. The mop-heads were probably wrung dry with the hands, which if not washed would be infected if any typhoid urine was present. The company colour-serjeant and the No. 3 room corporal stated that Nos. 2 and 4 cases were fairly clean in their habits, but that No. 3 had been checked for not washing himself.

Now all the cases from Nos. 1 to 5 used these night urinals, and it appeared to me certain that No. 1 case infected No. 2 room night urinal. It is less clear how No. 3 night urinal became infected until No. 2 case occurred; but the fact that both Nos. 2 and 3 night urinals are on a common discharge-pipe proves sufficiently that in all human probability the disease arose from No. 1 case. This is rather emphasized by the fact that the other room of the block, No. 4, which has a night urinal with separate discharge-pipe, produced no cases of enteric whatever.

The following precautionary measures were recommended, and have proved efficacious in preventing the occurrence of further cases of the disease.

(1) The barrack rooms in the affected block, particularly Nos. 2 and 3, to be scrubbed out with soda, soap and water, and afterwards with cresol solution. The bedsteads, tables, forms and all other articles of furniture, &c., to be similarly treated.

(2) The same procedure to be adopted for the ablution room and night urinals. The mop heads and pieces of flannel hitherto used for cleaning these places to be burnt. The mop handles may be preserved; but must be well scoured with soda, soap and afterwards with cresol solution.

(3) The discharge-pipes of the night urinals to be thoroughly flushed with water, and subsequently, the connection with the manhole having been blocked up, to be filled with cresol solution for twenty-four hours.

(4) The contacts, i.e., men of the block, to be isolated for three weeks—they may attend parades, &c., but must not mix with the other men. Separate latrine accommodation to be provided for them.

(5) If possible separate barrack accommodation for the men of the whole affected block to be obtained.

(6) The contacts to be medically inspected daily.

Since writing the above I paid a second visit to Reading in company with the Administrative Medical Officer, Portsmouth District, on the 9th inst., and was informed at the office of the Medical Officer of Health that there had been no cases of enteric fever at or near the Tilehurst milk supply farm.

During 1910 there were only seven cases of enteric at Reading, and none within one mile of the barracks.

I also interviewed the four patients Nos. 2, 3, 4, 5, of the series in hospital. They all denied having partaken of any food in common, and in fact had never associated together. No article such as watercress,

lettuce, or shell fish had been eaten during the past two months by them. So it is clear that though the probable dates of infection are about the same, the infection has no relation to this class of food.

On this last visit it was arranged, besides carrying out the above recommendations, to wash and afterwards disinfect all the utensils in the dining room at Anson Block. All blankets and bedding, as well as the clothing of the inmates of the block, were ordered to be disinfected in the Reading municipal high-pressure steam apparatus.

As a matter of fact, after the measures recommended above had been carried out in their entirety no further cases occurred.

At this time I made further inquiries from the men of Anson block. I found that three of them had suffered from enteric fever many years previously, i.e., in 1890, 1900, and 1903 respectively. Their blood was tested by Widal's reaction, but gave negative results in high dilutions. Their urine and fæces were likewise examined and plated on Conradi's brilliant green medium (Fawcus's modification), but no *B. typhosus* was recovered.

I have to put on record my thanks to the medical officer in charge at Reading (Lieutenant-Colonel Trewman, R.A.M.C., R.P.), for his help in getting the items of information outlined above; to Dr. Ashby, M.O.H., Reading, for facts as to incidence of enteric in the neighbourhood, as well as for a copy of his last Annual Report, and to Colonel Hathaway, A.M.O., for his permission to publish this Report.

NOTES ON A CASE OF INTRA-PERITONEAL RUPTURE OF THE BLADDER, COMPLICATED WITH FRACTURES OF RIGHT FEMUR, RIGHT WRIST, AND PNEUMONIA. OPERATION, RECOVERY.

By Major P. EVANS.
Royal Army Medical Corps.

Private X., aged 30, was admitted to the Military Hospital at Devonport, at 10.50 p.m., May 17, 1911. He had fallen from the window of his barrack room to the ground beneath, a distance of about 30 ft.

On admission he was conscious, and had evidently been drinking; he was suffering from shock with dilated pupils, rapid pulse, and subnormal temperature. On examination he was found to have sustained a fracture of the right wrist, a fracture of the middle third of the right femur, also a contused wound on the right side of the lower jaw leading down to the bone, and several abrasions on the right side of the head and face, and also of the left leg. He had passed his fæces involuntarily.

The wound over his jaw was sewn up and the fractures put up in splints. Hot bottles were applied, and hot drinks given to combat shock; at this time he did not complain of any abdominal pain, and nothing was made out on examining his abdomen.

About 1 a.m. he complained of pain in the lower abdomen with urgent desire to micturate, and inability to do so. A rubber catheter was passed, and a pint of blood-stained urine drawn off; he was by this time rallying from the shock.

At 3 a.m $\frac{1}{3}$ gr. of morphia was given, as he was in great pain, and he obtained relief from it.

At 8 a.m. the pain returned, and in passing a catheter about 4 oz. of blood-stained urine were drawn off, then half a pint of boric lotion was injected into his bladder, but scarcely any returned. A ruptured bladder was diagnosed.

At 8.15 a.m. a further injection of morphia $\frac{1}{3}$ gr. was given.

Twelve hours after the injury laparotomy was performed. Anæsthesia was induced with A.C.E. mixture, as he was still suffering considerably from shock.

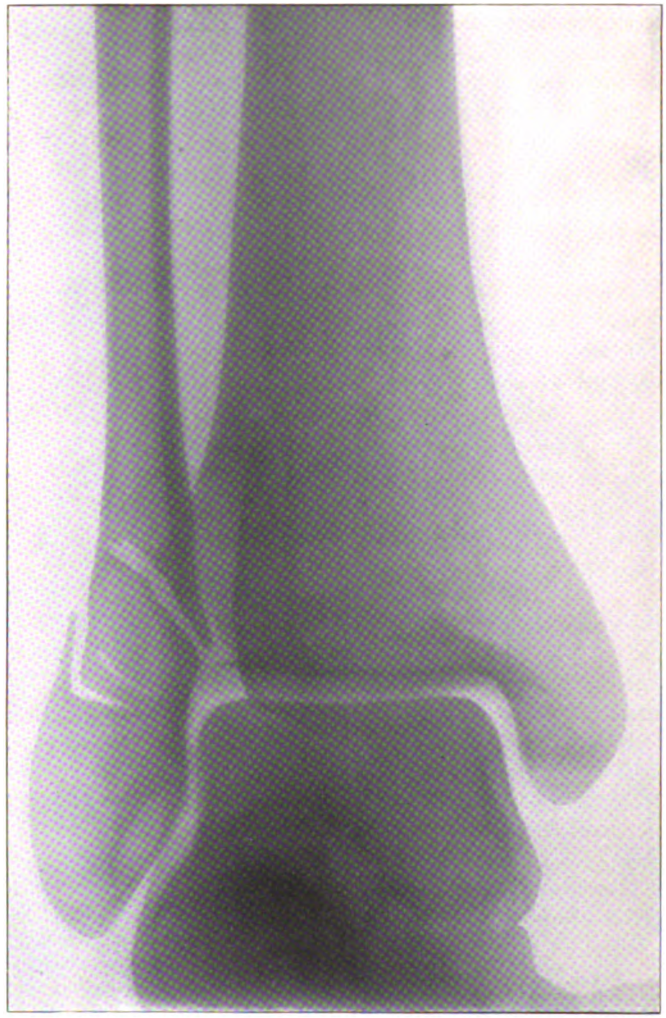
The abdomen was opened in the middle line between the recti from the umbilicus to about 3 in. above the symphysis pubis. On opening the abdomen the intestines were seen to be bathed in a considerable quantity of blood-stained fluid. The bladder was found to be collapsed and the tear was not visible, but on putting my hand into the pelvis a large rent was discovered admitting several fingers. The patient was inverted by placing the lower end of the operating table on chairs and the abdominal wound slightly enlarged, the intestines were then kept back by inserting a roll of gauze, and the lesion brought into view by catching the margins of the rent with Spencer-Wells forceps. The tear measured about 3 in. transversely, with a vertical slit extending forwards.

The wound was closed by catgut sutures passing through the peritoneum and muscular coats, and then reinforced by a layer of silk Halstead's mattress sutures through the peritoneum; owing to the amount of laceration the muscular coat was difficult to define. The collapse was treated by a rectal saline injection and brandy during the operation. On completion of the suturing the bladder was tested with boracic lotion, but as the patient was pulseless the testing had to be stopped and the abdomen rapidly flushed with hot saline—there was no time to swab the cavity dry, the wound was therefore hurriedly closed with silkworm gut sutures passing through all the layers of the abdominal wall, a large rubber tube passing down into the pelvis being left in the lower angle.

On the completion of the operation the bladder was continuously drained by a Jaques catheter with a long tube attached. The patient rallied well after the operation.

May 19, 1911.—Pelvic tube removed at 10 a.m., when a quantity of blood-stained serum came away; the discharge adhering to the lower end of the tube was slightly offensive.

A small tube substituted down to peritoneum, in the evening this tube was found in the dressings, so was not replaced.



To illustrate "Fracture of Fibula caused by Indirect Violence."
By Major F. W. Porter, R.A.M.C.

May 20, 1911.—Abdomen less distended. Fractured thigh troublesome. Catheter changed at 7 p.m., and ʒii sod. sulph. given.

May 21, 1911.—Bowels acted well during night, but pulse was bad and necessitated a hypodermic injection of digitalin. Catheter changed at 5 p.m.

May 22, 1911.—Catheter changed twice daily. Urine clear. Abdominal wound dressed, looking healthy.

May 26, 1911.—Catheter removed at 10.30 a.m. and left out. Urine drawn off at 12.30 p.m. (8 oz.), 4 p.m. (12 oz.), and 7.30 p.m. At 10 p.m. he complained that he had passed urine in bed three times.

May 27, 1911.—The patient is continually passing small quantities of urine. Tongue brown. Urine not thick but some *débris* comes away with it. Catheter discontinued as patient cannot wait for it to be passed when the desire to micturate comes on.

May 28, 1911.—Stitches removed. The wound is healed except at the upper angle and where the tube was removed.

Subsequent History of Case.

Pneumonia of the right base supervened on May 26, 1911, followed by consolidation at the left apex with a temperature varying between 103° and 100° F., which lasted until June 16, 1911. The patient was discharged hospital on October 25, as an invalid owing to lameness.

The bladder gives him no trouble, and he can hold his water at nights from 9 p.m. to 4 a.m. The abdominal scar is firm, but he has been supplied with a belt, as the right rectus bulges somewhat owing to the anterior sheath below the umbilicus being displaced outwards.

The after-treatment required much care, and consisted in continuous drainage for eight days, the catheter being changed twice daily; later the urine was drawn off every four hours, but this procedure was a failure, as the patient could not wait to have a catheter passed, so instead care was taken for several weeks that he passed his urine at least every four hours. The urine was never septic, but he was given boric acid gr. 10 t.d.s.

I am indebted to Major H. D. Packer, R.A.M.C., for his accurate diagnosis and assistance at the operation.

FRACTURE OF FIBULA CAUSED BY INDIRECT VIOLENCE.

By Major F. J. W. PORTER.

Royal Army Medical Corps.

The patient, aged 23, stated that his foot slipped into a wide shallow gutter and that he fell over on to his side. The radiogram shows two fractures of the lower end of the fibula, one of which does not appear to be complete. The case is of interest on account of the double fracture caused by indirect violence.

SUGGESTED MODIFICATIONS OF A.B. 166 (SPECIFICATION TALLIES).

By Captain F. W. COTTON.
Royal Army Medical Corps.

The modifications of A.B. 166 shown below are suggested with the idea of:—

(1) Keeping some permanent record of sick and wounded on their way from front to base.

(2) Saving time during periods of great pressure of work.

(3) Enabling officers in charge of a sick convoy to find out in the shortest possible time the essential points of any case requiring treatment.

(4) Doing away with A.B. 172 (Transfer Book) in the Clearing and Collecting zones where facilities and time for clerical work are limited.

AB 166

This Label to remain with the Patient until a stationary or general Hospital is reached.

1	**Adt. Fd. Ambl. No.**	**Date**	**Place**
2	**Transfd. Clg. Hpl. No.**	**Date**	**Place**
3	**Do. Sty. or Gen. Hpl. No.**	**Date**	**Place**
4	**No. & Name**	**Age**	**Service**
5	**Rank & Regt.**		**Religion**
6	**Wound : Lower or Upper Arm, Leg, Head, Neck, Throat, Abdomen.**		
7	**Treatment : 1st Field Dressing, Temporary Splint and Tourniquet.**		
8	**Signature of M.O.**		
9	***NOT TO BE MOVED OR GIVEN WATER.***		

AB 166

Treatment in Dressing Station	**Treatment in Field Ambulance**	**Treatment in Clearing Hospital**	**Information for O. i/c Sick Convoy, Diet, &c.**

Two forms have been devised, A.B. 166 for wounded, and A.B. 166 (a) for sick; the ordinary ordnance luggage label (A.F.S. 1028) has

been chosen as the pattern on which to work. It is suggested that the proposed A.B. 166 replace the present A.B. 166, and A.B. 166 (A) replace the present A.B. 172 in the Collecting and Clearing zones. It is not suggested that these books should have counterfoils, as medical officers working with troops have no time for filling these in and in Field Ambulances the place of transfer is kept in A.B. 27 (A and D Book). In using both of these forms it is suggested that they should be fixed on the patient in some conspicuous position, e.g., breast pocket, and remain there until the patient arrives at his hospital, when they may be collected and attached to case sheets or kept for statistical purposes. Objection may be made that labelling a patient is useless and unnecessary. Only those who have taken over a large convoy of sick know the difficulties of sorting out and treating the different cases. If each case is labelled a whole convoy can be divided into serious, non-serious and infectious cases with a minimum of time and labour: moreover any intelligent orderly or N.C.O. could do it.

AB 166 (a)

Label to remain with Patient until stationary or general Hospital is reached.

1	**Adt. Fd. Ambl. No.** **Sec.**	**Date**	**Place**	
2	**Transfd. Cl. Hpl. No.**	**Date**	**Place**	
3	**Do. Genl. Stry. Hpl. No.**	**Date**	**Place**	
4	**No. & Name**		**Age**	**Service**
5	**Rank & Regt.**		**Religion**	
6	**Disease & Note *re* Condition, &c.**			

Sign. of M.O.

For Infectious Cases only.

Movements Last 14 Days

Sanitary Conditions

Presence of Epidemic Disease amongst Local Inhabitants

A glance at the suggested A.B. 166 shows that little explanation is needed. The medical officer rendering first aid deletes the words in lines 6 and 7 which do not apply and adds anything he may consider necessary. In the dressing station it would be inferred from the colour of the form whether the wound is serious and from the treatment whether fracture or hæmorrhage or both were present. Line 9 is deleted or left as required. Lines 1, 4 and 5 are completed in the Field Ambulance, the identity disc gives most of the information for lines 4 and 5. Lines 2 and 3 are filled in when the patient is transferred. The back of the form is used for recording treatment and could be filled in by anyone at the dictation of a medical officer. The last note for the officer of a sick convoy should give only information of practical use e.g., "requires watching for—" or "abdominal wound, restrict fluids," &c.

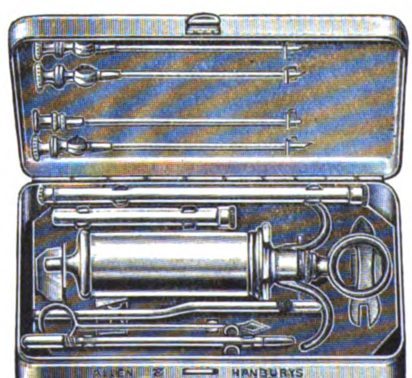
The proposed A.B. 166 (a) is much the same as A.B. 166. It is suggested that these forms be in two colours, red and white; red for infectious cases, white for non-infectious, and that this form be only used between field ambulances and hospitals.

The back of the form need only be filled in when columns are operating alone and it is wished to draw attention to some special camp or district where an epidemic is raging.

REPORT ON ALL-METAL SYRINGE FOR PURPOSES OF SPINAL ANALGESIA.

By Major F. J. W. PORTER, D.S.O.
Royal Army Medical Corps.

The all-metal syringe for local analgesia which was devised by me a few years ago and manufactured by Messrs. Allen and Hanbury, has recently been adapted by them for purposes of spinal analgesia.



Scale 1/3

Three needles are now carried in clips in the lid of the box, and bearing in mind the necessity for making certain they are not blocked by blood clots, in cases where the cerebrospinal fluid does not flow, cannulæ which extend right to the tips are provided.

A cannula for the purpose of drawing the solution into the barrel, and by means of which all air may be expelled, is also furnished. A triangular-edged knife for puncturing the skin is carried in the box.

Travel.

A REPORT ON THE OASIS OF SIWA.

By Captain C. V. B. STANLEY.
Royal Army Medical Corps.

(Summary by Major S. L. Cummins, Royal Army Medical Corps.)

In October, 1910, it was reported that cholera was prevalent in Tripoli, and in view of the possibility of infection reaching Egypt over the western frontier, Captain C. V. B. Stanley, R.A.M.C., a Divisional Inspector in the Department of Public Health under the Egyptian Government, was sent on a mission to Siwa, an oasis at the northern part of the Libyan Desert, to decide on measures for the protection of the Nile Valley. In addition to this primary duty he was also instructed to study " the topographical character of the country, the inhabitants, such vital statistics as are available, the prevalence, conditions, and causes of infectious disease (with especial reference to malaria), the economic situation of the country and the social features of the population."

Captain Stanley's Report to the Director-General of his Department is of great interest in throwing light on the conditions of life of a community cut off, to a great extent, from the outside world, and on a people whose characters, intensified by their isolation, are typical of a phase of human existence that is rapidly passing away as facilities of communication break down the barriers of time and space. His journey is such as has often been described and need not occupy our attention beyond the quotation of one apt phrase, which sums up in a few words the monotony of travel in the desert. " The impression gathered is that of walking in the middle of a huge plate and never getting any nearer the edge." It is Siwa itself and its people that interest us, and Captain Stanley's vivid

descriptions enable us to visualize both. "The Oasis is only a part of the great depression in which it lies"—the desert level being about 400 ft. above, and that of Siwa 70 ft. below, sea-level—"and which extends from Zeitown in the east to Baideen and Maraghe in the west, a distance of over 30 miles in length. Its breadth from the northern hills to the sand-dunes on the south is from four to five miles. About a quarter of this area is under cultivation, the rest being sand, salt lakes, and 'sebbakeh,' or salt lands. The cultivated land is generally at a higher level by two or three feet than the surrounding sebbakeh, and is always carefully fenced in by neat hedges made of palm branches."

"The whole oasis is fringed by a belt of sandy soil in which halfa grass, tarfa shrubs and stunted palms flourish. The ground over a great part of the sebbakeh is white from outcrops of pure salt. A year's supply of this salt is collected by the natives *on the eve of Courban Bairam and at no other time*, and on this day hundreds of donkeys and labourers can be seen taking loads of it away."

The Springs.

The life of the Siwans is intimately connected with their springs, which are numerous and of great celebrity throughout Northern Africa. Captain Stanley speaks of them as follows :—

"The most striking feature of Siwa is undoubtedly its springs, which at one time are said to have numbered 2,000, of which only eighty are in use. They are generally from 30 to 80 ft. in diameter and about 20 ft. deep. The water in them is particularly clear and sparkling; continuous streams of bubbles are always ascending to the surface, in some cases with such rapidity and violence as to give the impression that the water is boiling. Some of the springs are hot, such as those of Ain el Hammam and Ain Famoosa, which are in constant use by the women for bathing and washing clothes. The water is saline in varying degrees—most of it excellent to drink."

The rich Siwans have one or more "hattias" (gardens) of their own, each with its spring and perhaps a couple of thousand date trees, but amongst the poorer people there may be several owners of one hattia, each cultivating his own plot, which is separated from the rest by a well-made palm hedge.

Where disputes arise over the division of the water—a constant occurrence—they are referred to the "Rakkab" of the Spring, an official charged with the settlement of such differences. His decisions are made according to a code laid down in the "Dafter el

Ain," or "Book of the Springs," which contains precise instructions for the guidance of cultivators. The wealth of Siwa is derived from its dates and olives, which are grown for export and traded to the Arabs, but in addition a fair variety of fruit and vegetables is raised for local consumption. Garlic is held in great esteem as a preventive of sickness. *It is only eaten for a period of four to seven days in October*, during which large quantities are consumed. The men and women separate during the Garlic Festival.

Captain Stanley gives some interesting particulars about the varieties and relative values of the dates grown at Siwa, for which the text of his report should be consulted.

The importance of the date trade will be realized when it is noted that this oasis of roughly 4,000 inhabitants exports from 6,000 to 7,000 camel-loads of dates yearly to the coast, between Benghazi and Alexandria chiefly. The average yield of a date-tree is put at about fifty pounds weight of fruit.

A full olive crop is only taken every second year. About half the crop is consumed locally.

Towns.

There are only two towns in the Oasis, Siwa and Aghourmi, with a few scattered hamlets and an interesting settlement of rock-dwellers who have housed themselves in some ancient tombs in the mountain at Maraghe, seven miles west of Siwa.

The original town of Siwa is built on a hill, and appears as a solid mass of brown masonry presenting an unbroken front except where the original gate existed. A point of great interest is the complete separation of the inhabitants according as they live in the east or west part of the town. This difference has existed for generations and has led to many a sanguinary encounter even in recent times. Its influence is stamped on the very buildings, the old Treasury, for instance, having on its door two heavy wooden locks, one for the east, the other for the west, so that it could only be opened when a representative of both parties was present. The boundary between east and west is still to be seen, and even now the inhabitants, when they move to new dwellings, maintain their old division, the easterns moving to Manchia, the westerns to Karret el Belad.

"The interior of the town is a veritable labyrinth of streets a yard wide or less, steep flights of rough steps, rocky slippery passages and tunnels leading up and down, here and there, in a most bewildering fashion." Altogether a typical Oriental town

snugly clinging to its traditions and untroubled—thanks to its desert barriers—by Western notions of improvement and progress.

Aghourmi seems to be very much the same, but its people have always held themselves aloof from the Siwans and their quarrels.

The Siwans are said to be of Berber origin, while the people of Aghourmi are supposed to be descended from "the Nazrani stock." As a matter of fact there appears to be "considerable mixture of both Arab and Sudanese blood, but not enough to have banished the dominant Siwan type, which Captain Stanley describes as follows :—

"There is none of the warm colouring of the Egyptians, their complexions being a pale ashy grey. They have generally short straight noses, thin lips, and weak chins, in which the sub-labial depression is often absent. The hair is straight and dark in colour, but not black.

"Some of the women are good-looking, but they are kept strictly secluded. Black eyes are the rule, but grey or blue may be noticed.

"The women spend their time at embroidery and in doing coloured straw basket-work, at which they are very clever."

Two religious sects prevail, the "west" being all Senoussi, the "east" partly Senoussi and partly Madani. But the real division of the little community is the traditional one of east and west, and the eastern, be he Senoussi or Madani, will always be up in arms against the western, and *vice versâ*. No actual hostilities have occurred for some years, the last big fight having been in April, 1897, when the notorious Hassouna Mansour and six other sheikhs were killed with one hundred of their men, eighty others being wounded. The two factions, however, still keep much apart.

"The morals of the Siwans have always been a byword and a reproach amongst those who come in contact with them. They are generally untruthful, lazy, given to intrigue, easily excited to mirth or anger, and swayed by every wind that blows."

They are a musical people, much given to singing, and using such instruments as drums, a stringed instrument, the Zamorra and the castanet. A very interesting peculiarity is that they *can translate speech into music*, the various notes and cadences having definite meanings, so that the music, even when extempore, is understood by the audience just as speech would be.

Captain Stanley describes how a flute-player gave, on his instrument, a long musical discourse describing the journey and beneficent actions of the Sanitary Inspector, the sheikh, *translating the music into Arabic the while.*

The report contains accounts of several interesting ceremonies that deserve the attention of anthropologists, such as the local customs at the feast of Yom Ashura, where the children exchange palm-branch frame-works decorated with torches, fruit, mint and sweets, the boys' frame-work being in the shape of a cross, while that of the girls' resembles and is called a "window."

There is also a ceremony for the drinking of tea, a habit much in vogue amongst the Siwans, but space does not admit of a full description of these customs, for which the report should be consulted.

Siwa was famed as the site of a Temple of Jupiter Ammon, about a dozen huge blocks of which, with their hieroglyphic inscriptions, still remain standing. Close to them is a small and nearly obliterated fountain, said to have been the celebrated "Fountain of the Sun."

In Ydrar Nasra is a rock-hewn cave called Tenachoor, with six square supporting pillars, and round the western face of the same rock are some Greek inscriptions. Under the summit of Ydrar Nasra is a large rock chamber, with the remains of six columns, and into which three rooms open.

Gebel Muta, "the Hill of the Dead," presents a very striking appearance, being riddled with tombs from base to summit. Some of the tombs are now inhabited by poor Arabs. Seven miles west of Siwa is a group of ruins known as Kasr-el-Roum, where Captain Stanley found, close under the sand, two fragments of a tablet with a carved Greek inscription. A quarter of a mile away are the remains of a Temple. Here, tradition says, a number of books were found and burnt by the Siwans who feared that the Christians should read them, find out that the country had originally belonged to them, and attempt to re-occupy it. It is evident that thorough archæological research might reap an interesting harvest around Siwa.

Diseases.

Captain Stanley proved the "Siwan fever," to be nothing more nor less than malaria, which was to be expected from the system of irrigation in vogue and the presence of much standing water. He reports that preventive measures, to be effective, must be on a very large scale, hardly to be contemplated for such a small and poor community.

Measles, small-pox, diphtheria, and dengue occasionally visit

Siwa, and tuberculosis, ophthalmia, and venereal diseases are of common occurrence.

Superstitions.

The Evil Eye is as much feared here as elsewhere throughout Africa. In this connection, a curious custom is reported which deserves to be quoted. When a man dies his wife is shut up for four lunar months and ten days. During this period she is known as "Aghoula," and is dressed in white and confined to one room, seeing nobody except a girl attendant who brings her food but does not stay with her. At the end of the period, the town crier announces that she will bathe in Ain Tamoosa on a certain morning. On this day, nobody in the town ventures forth until the Aghoula has completed her purification and returned to her house, as evil is sure to befall anyone on whom her gaze may fall. Probably, a similar belief exempted Lady Godiva from the scrutiny of all except "Peeping Tom," who suffered for his temerity.

Both good and evil spirits, Melaika and Afryts, are believed to exist in numbers. Love philtres and charms are in constant use. It is regarded as part of the marriage ceremony for the bride to bathe in the spring of Ain Tamoosa on the wedding night.

Captain Stanley gives an interesting list of native remedies which are very similar to those in general use by the Arabs, and for which the report should be consulted. He also gives an account of Siwan money, weights and measures, and a very important note on the Siwan language, including a vocabulary of seven hundred words, notes on the grammar, and a list of Siwan personal names. The report also includes a local history of Siwa in two parts, one dealing with tradition, the other with the more recent history of the Oasis and the constant feuds between east and west. A number of capital photographs illustrate the report.

Altogether, the author is to be congratulated on an important contribution to the anthropology of Northern Africa.

Echoes from the Past.

NOTE FROM WEST AFRICA.

COMMUNICATED BY CAPTAIN N. E. HARDING.
Royal Army Medical Corps.

THE following extracts from the old records in the Senior Medical Officer's office in Sierra Leone give a ghastly picture of what life there was like ninety years ago. To the kindness of Colonel W. Johnston, C.B., I owe the information that the writer of the report was appointed Assistant Surgeon of the Royal African Corps on July 8, 1824, and was promoted to be Surgeon to the Forces on April 20, 1826.

By way of contrast the figures for 1909, the last year available, may be of interest, though they are for West Africa generally, and not for Cape Coast alone, where there are now no troops. The average strength of Europeans in that year was 268, with no deaths and four invalids, of whom three were finally discharged; the average number constantly sick was not quite thirteen.

"MEDICAL REPORT ADDRESSED TO SIR JAMES McGRIGOR, DATED CAPE COAST, DECEMBER 20TH, 1824.

"No less than 217 deaths have occurred in the Regiment besides women and children." "The Soldiers in general that were sent out from England this year to join the Rl. Afr. Corps were men of the most depraved habits prone to all sorts of vice, drunkenness, whoring, stealing, in short every act that is bad; as for punishment to amend their habits it had no effect whatever, for as soon as a soldier got well of his flogging or any other complaint he returned to his old practice, to use a phrase, like 'the sow returning to her wallow.' When the Question of 'Why do you drink to such excess' was put to them the answer always was, 'I cannot do without it, as it is the only comfort we have in this country,' consequently whenever a soldier could get the means to make him drunk he invariably gratified his appetite." "Out of 42 women and 67 children that arrived since October, 1823, 29 women and 41 children are dead, 27 gone to England and 12 remain; this is sufficient to strike every mind with horror and dismay, and to put a final stop to officers and soldiers bringing their wives and children to this part of the globe. I sincerely hope I will never re-witness the many trying sights I have done

this year in beholding the father, the mother and four or five children laid up with fever in a small hovel of a place totally helpless to each other, and gradually dying without being able to mitigate their sufferings in a small degree." "Out of the second detachment of 129 that arrived in Octr., 1823, under the command of Capt. L'Estrange, only a few remain." "Out of the third detachment of 131 men that was disembarked here on the 12th of March, 1824, under the command of Lieut. McCombie, from the Cape of Good Hope, the majority of them died a few months after their landing." "Out of the fourth detachment that came to this place on the 20th of March in the Brig 'Ann' from England, consisting of 33 men . . . only six are living." "Out of the fifth detachment that arrived . . . on the fourth of July from England, consisting of 101 men, 45 have died."

"JOHN BELL.
"*Acting Surgeon,*
"*Rl. Afr. Corps.*"

"*Cape Coast Castle,*
Decr. 26, 1824."

Translation.

STATISTICAL DATA CONCERNING THE LOSSES OF THE RUSSIAN ARMY FROM SICKNESS AND WOUNDS IN THE WAR AGAINST JAPAN, 1904-1905.

The Military Historical Magazine (*Voenno-istoricheski Sbornik*), Nos. 3 and 4, 1911.

ARTICLE BY N. KOZLOVSKI.

TRANSLATED BY MAJOR G. S. McLOUGHLIN, D.S.O.
Royal Army Medical Corps.

A. SICKNESS AMONGST THE TROOPS AND LOSS FROM DISEASE.

(1) INCIDENCE AND LOSS (FROM DISEASE) DURING THE PERIOD OF ACTIVE MILITARY OPERATIONS.

THE incidence of disease and the loss from disease amongst the troops (of the Manchurian armies, on the line of communications, in the Pri-Amur military district, in the Kuantung fortified zone, of the forces in Korea and in the island of Sakhalin) during the military operations, i.e., from the date of the declaration of war (February 9, 1904) until the date of ratification of the treaty of peace (October 14, 1905), are shown by the figures given in Table I.

TABLE I.

	Actual numbers			Per 1,000 of average strength*		
	Officers	Men	All ranks	Officers	Men	All ranks
I. Contracted disease ..	11,788	346,289	358,077	799·7	527·3	533·3
Of these :						
(*a*) Recovered	8,174	197,837	206,011	554·5	301·2	306·8
(*b*) Died..	198	9,411	9,609	13·43	14·33	14·31
(*c*) Discharged as unfit	—	19,927	19,927	—	30·3	29·7
(*d*) Evacuated to home territory	2,348	91,653	94,001	159·3	139·6	140·0
(*e*) Remaining under medical charge in the Far East	1,068	27,461	28,529	72·5	41·8	42·5
In addition :						
II. Of the number evacuated—						
(*a*) Died..	5	273	278	0·34	0·42	0·41
(*b*) Discharged as unfit	—	28,552	28,552	—	43·5	42·5
III. Sudden deaths—						
(*a*) From disease ..	23	405	428	1·56	0·62	0·64
(*b*) ,, accident ..	17	580	597	1·15	0·88	0·89
(*c*) ,, suicide ..	49	137	186	3·32	0·21	0·28
IV. Died while prisoners of war	11	1,019	1,030	0·75	1·55	1·53

* 14,740 officers and 656,750 men.

In amplification of this table, the following particulars are expressed as ratios:—

(1)	Proportion of strength of officers to strength of lower ranks.. ..	= 1 : 44·6
(2)	,, sick among officers as compared with lower ranks ..	= 1 : 29·3
(3)	,, deaths ,, ,, ,, ..	= 1 : 39·0
(4)	,, sick per 1,000 among officers as compared with lower ranks	= 1·5 : 1·0
(5)	,, deaths per 1,000 among officers as compared with lower ranks	= 1·1 : 1·0
(6)	Sick-rate per 1,000 of officers during the period of active operations	799·7
(7)	Death-rate ,, ,, ,, ,, ,,	20·55
(8)	Average monthly sick-rate per 1,000 of officers	39·9
(9)	,, ,, death-rate ,, ,, ...	1·03
(10)	Sick per 1,000 of lower ranks during the period of active operations	527·3
(11)	Died ,, ,, ,, ,, ,,	18·01
(12)	Discharged as unfit per 1,000 of lower ranks during the period of active operations	73·8
(13)	Average monthly sick-rate per 1,000 of lower ranks during the period of active operations	26·3
(14)	Average monthly death-rate per 1,000 of lower ranks	0·9
(15)	Discharged as unfit per 1,000 of lower ranks during an average month	3·7

(2) Sickness and Loss from Disease amongst the Troops Remaining under Peace Conditions.

For the same period of twenty months, the sickness and loss from disease amongst the troops in the military districts of the Caucasus, Turkestan, Siberia and the home territory are shown as follows:—

TABLE II.

	Actual numbers			Per 1,000 of average strength*		
	Officers	Men	All ranks	Officers	Men	All ranks
I. Contracted disease ..	32,292	766,631	798,923	719·8	621·2	624·7
Of these :						
(*a*) Recovered	31,827	682,542	714,369	709·4	553·1	558·5
(*b*) Died..	465	6,883	7,348	10·36	5·58	5·75
(*c*) Discharged as unfit	—	77,206	77,206	—	62·56	60·36
In addition :						
II. Died suddenly—						
(*a*) By disease	69	259	328	1·54	0·21	0·26
(*b*) ,, accident ..	30	714	744	0·67	0·58	0·58
(*c*) ,, suicide	97	245	342	2·16	0·20	0·27

* 44,864 officers and 1,234,121 men.

It is apparent, as a result of the study of Tables I. and II., that the whole Russian Army serving during the period of twenty months occupied by the campaign against Japan lost 20,890 men (11·3 per thousand) by death resulting from disease, accident and suicide; and that the whole army lost also 125,685 men (67·1 per thousand) who were discharged as unfit. It further appears that among the troops engaged in active operations the sick-rate was 91·4 per thousand less, that the general death-rate (from disease, accident and suicide) was 11·2 per thousand more, and that the proportion of men discharged as unfit was 9·64[1] per thousand more, than among the troops remaining under peace conditions.

(3) SICKNESS AND LOSS FROM DISEASE AMONG THE TROOPS REMAINING IN NORTHERN MANCHURIA AFTER THE RATIFICATION OF THE TREATY OF PEACE.

The sickness and loss from disease among the troops remaining in Northern Manchuria after the ratification of the treaty of peace until March 14, 1907,[2] are shown in Table III.

TABLE III.

	Actual numbers			Per 1,000 of strength*		
	Officers	Men	All ranks	Officers	Men	All ranks
I. Remaining under medical charge, at commencement of period	1,068	27,461	28,529	202·2	111·3	113·2
II. Contracted disease ..	3,401	81,016	84,477	643·8	328·4	335·0
Of the above :						
Recovered	3,094	87,118	90,212	585·7	353·1	358·0
Died	71	1,429	1,500	13·44	5·80	5·96
Discharged as unfit ..	—	1,133	1,133	—	4·6	4·5
Evacuated to home territory	1,304	18,797	20,101	246·8	76·2	79·8
III. Sudden deaths—						
(*a*) By disease ..	4	28	32	0·76	0·11	0·12
(*b*) ,, accident ..	5	107	112	0·95	0·43	0·44
(*c*) ,, suicide ..	14	16	30	2·65	0·06	0·12

* 5,283 officers and 246,698 men.

[1] There seems to be a mistake here (*Trans.*).

[2] The "massed corps" of Manchuria was re-formed under Army Order No. 142 of March 25, 1907.

Consequently, in this period, among the troops serving in Northern Manchuria, the following casualties occurred :—

	Per 1,000 Officers	Men	All ranks
Contracted disease	643·8	328·4	335·0
Died (suddenly or under medical charge)	17·8	6·4	6·64
Discharged as unfit	—	4·6	4·6
Of sick under medical charge	Per cent.		
Died	2·09	1·76	1·77
Discharged as unfit	—	1·4	

(4) Sickness and Loss from the Beginning of Hostilities until the Date of the Evacuation of Manchuria by Russian Troops.

(a) *A Summary of the information presented in Tables I. and III., showing the total incidence and loss during the campaign, is given in the following Table :—*

TABLE IV.

	Actual numbers Officers	Men	All ranks	Per 1,000 of strength* Officers	Men	All ranks
I. Contracted disease	15,189	427,305	442,914	1,461·2	912·4	924·3
Of these :						
(a) Recovered	11,268	284,955	296,223	1,084·0	608·4	618·7
(b) Died	269	10,840	11,109	25·88	23·15	23·21
(c) Discharged as unfit	—	21,060	21,060	—	45·0	44·0
(d) Evacuated	3,652	110,450	114,102	351·3	235·8	238·3
In addition :						
II. Of those evacuated—						
(a) Died	5	273	278	0·48	0·58	0·58
(b) Discharged as unfit	—	28,552	28,552	—	61·0	59·6
III. Sudden deaths—						
(a) By disease	27	431	458	2·60	0·92	0·96
(b) ,, accident	22	687	709	2·12	1·47	1·48
(c) ,, suicide	63	153	216	6·06	0·33	0·45
IV. Died when prisoners of war	11	1,019	1,030	1·06	2·18	2·15

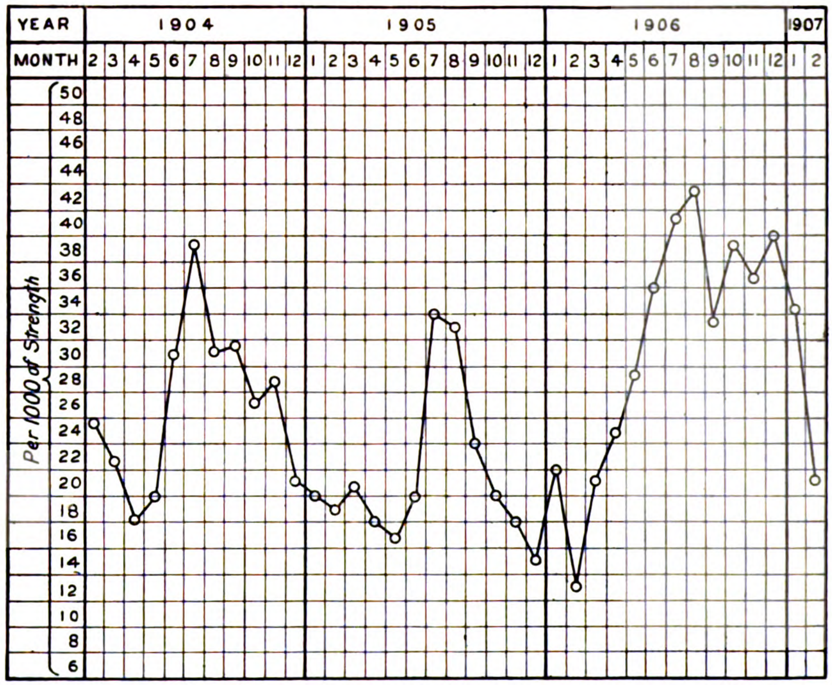
* 10,395 officers and 468,348 men.

Consequently, in the period (of thirty-seven months) of active operations and of the later occupation of Manchuria by the Russian Army :—

	Per 1,000 of strength Officers	Men	All ranks
Contracted disease	1,461·2	912·4	924·3
Died from disease and accident	39·28	28·63	28·83
Discharged as unfit	—	106·0	
Of sick under medical charge—	Per cent.	Per cent.	Per cent.
Died	1·80	2·63	2·57
Discharged	—	11·6	

(b) *Monthly Sick-Rate.*

The sick-rate per 1,000 of strength in each month is represented in the following diagram (for old style months):—



This diagram shows that the sick-rate in each year was highest during the summer months. This was due to the augmented incidence of enteric fever, dysentery, influenza, intermittent (malarial) fever and acute gastro-intestinal catarrh (epidemic gastro-enteritis). The above-mentioned diseases in June, July, August and September generally accounted for from 60·0 to 83·5 per cent. of the total sick-rate.

(c) *Sick-Rates according to Classification of Troops.*

TABLE V.

Classification	Contracted Disease — Actual numbers — Officers	Contracted Disease — Actual numbers — Men	Contracted Disease — Per 1,000 of strength — Officers	Contracted Disease — Per 1,000 of strength — Men
Infantry	11,773	310,024	2,033·3	906·7
Artillery	1,124	40,167	1,075·6	857·7
Cavalry	988	14,528	1,431·9	776·9
Engineers	305	13,674	726·2	729·3
Frontier Guards ..	87	10,452	152·6	441·1
Other troops	912	38,460	440·6	1,368·7

Consequently, the highest rate was amongst the infantry officers and the lower ranks of the various kinds of "other troops," and the lowest amongst the officers and men of the Frontier Guards. If the sick-rate of the officers and men of the Frontier Guards be represented by 1, then the proportional ratio of sickness in various branches may be shown as follows:—

	Officers	Men
Frontier Guards	1	1
Infantry	13·3	2·0
Artillery	7·0	1·9
Cavalry	9·3	1·7
Engineers	4·7	1·6
Other troops	2·9	3·1

(*d*) *Sick-rate and Death-rate acccording to Classification of Diseases.*

TABLE VI.

	Actual numbers		Per 1,000 of strength		Case mortality per cent
	Infected	Died	Infected	Died	
(1) Influenza	37,788	92	78·9	0·2	0·3
(2) Enteric fever	24,663	4,566	51·6	9·5	18·5
(3) Typhus..	351	62	0·7	0·1	17·7
(4) Relapsing fever	198	17	0·4	0·04	8·6
(5) Dysentery	9,851	1,109	20·6	2·3	11·3
(6) "Siberian sore" ..	1,085	127	2·3	0·3	11·7
(7) Smallpox	252	26	0·5	0·05	10·3
(8) Croupous pneumonia ..	1,865	291	4·0	0·6	15·5
(9) Tuberculosis of lungs ..	1,201	351	2·6	0·7	29·2
(10) Syphilis	10,811	8	22·6	0·02	0·7
(11) Other venereal diseases	21,466	—	44·6	—	—
(12) Intermittent fever ..	26,432	29	55·2	0·06	0·1
(13) Scurvy	6,510	778	13·6	1·6	11·9
(14) Acute gastro-enteritis..	43,763	212	91·4	0·4	0·5
(15) Other diseases	256,258	3,441	535·3	7·2	1·4
Totals	442,494	11,109	924·3	23·2	2·57

* Anthrax, I think (*Trans.*)

So it appears from the foregoing Table that the special diseases which contributed most highly to the sick-rate were (in order) acute gastro-enteritis, influenza, intermittent fever, enteric fever, and venereal diseases other than syphilis. The diseases which caused the highest number of deaths were (in order) enteric fever, dysentery, and scurvy. The highest mortality per cent of cases was shown in the patients suffering from tuberculosis of lungs, enteric fever, typhus, croupous pneumonia, scurvy,[1] "Siberian sore," dysentery and smallpox (given in order of deadliness).

[1] The mortality in cases of scurvy is shown as being very much higher in Port Arthur than elsewhere: 41·7 per cent of the Port Arthur cases died, whereas the case mortality from this disease was in the Manchurian armies not more than 1·5 per cent.

(*e*) *Sudden Deaths from Accident and Suicide.*

Table IV. shows the losses per thousand of strength from accident (or misadventure), and suicide amongst officers and men respectively. The Table shows loss from accidents to officers to have been, proportionately, 1·4 times as great and from suicide 18·4 times as great as the corresponding losses amongst the men.

Of the number of officers who died suddenly by misadventure, 24 per cent were drowned and 36 per cent died from sunstroke; of suicides among officers 92 per cent were caused by firearms.

Of the number of men who died by misadventure, alcoholism accounted for 19 per cent, drowning for 17 per cent, railway accidents for 12 per cent and sunstroke for 11 per cent; of suicides amongst the men, 83 per cent were caused by shooting, and 7 per cent by hanging.

B. LOSSES CAUSED BY WEAPONS OF THE ENEMY.

(1) Total Losses by Act of the Enemy.

The losses of the Russian Army incurred in action against the Japanese are shown in the following Table :—

TABLE VII.

	Actual numbers			Per 1,000: Of strength of units taking part in the actions*			Per 1,000: Of mean strength of troops during the period of operations		
Casualties in action	Officers	Men	Officers and men	Officers	Men	Officers and men	Officers	Men	Officers and men
(1) Killed	841	24,003	24,844	78·44	45·37	46·6	57·06	36·55	37·00
(2) Wounded ..	4,228	142,291	146,519	394·36	268·97	271·5	286·8	216·7	218·2
(3) Prisoners—									
(*a*) Total	975	58,243	59,218	90·94	110·1	109·8	66·1	88·7	88·2
(*b*) Wounded † ..	217	5.208	5,425	20·24	9·84	10·0	14·7	7·9	8·1
Total losses ..	6,044	224,537	230,581	563·75	427·2	427·2	410·0	341·9	343·4

* Officers 10,721, lower ranks 529,013.

† Not counting the wounded in the hospitals at Port Arthur on the date of the capitulation : these are included in the general return of wounded.

Consequently, units which took part in the fighting lost in killed, wounded and captured, 56 per cent of the strength of officers and about 43 per cent of the strength of lower ranks. The losses among officers were in killed and wounded proportionately about one and a half times as great as among the lower ranks, whereas the proportionate number of captured was 19·16 per cent higher among lower ranks than among officers. The proportion of killed to wounded was as 1 : 5·9 : of officers, for every hundred killed, 502 were wounded; of lower ranks, for every hundred killed, 592 were wounded.

(2) Losses in Individual Actions.

The following table gives the actual casualties in fourteen enumerated actions :—

TABLE VIII.

Actions, 1904	Actual numbers							
	Killed		Wounded		Missing *		Total losses	
	Officers	Lower ranks	Officers	Lower ranks	Officers	Lower ranks	Officers	Lower ranks
(1) At "Turenchen" (Yalu), April 30—May 1	26	567	38	1,085	4	474	68	2,126
(2) At "the Kinjou positions" (Nan Shan), May 26	8	174	6	830	10	588	24	1,592
(3) At "Vafangou" (Te-li-ssu), June 14-15	18	552	98	2,240	10	643	126	3,435
(4) "At Wolf Hills," † July 3-5	4	100	10	730	—	10	14	840
(5) At the position of passes (Kuan-tung), ("Siaokaolin, Sibailin and Ufanguan"), July 17-19	8	215	37	1,069	2	224	47	1,508
(6) At Ta-shih-chiao, July 23-24	4	144	37	743	3	110	44	997
(7) At Wolf Hills (Feng-huang Shan), July 30	2	150	3	412	1	93	6	655
(8) At the passes: Yang-tsu-Ling, Yu-shu Ling, Pien Ling and "Kongualin," July 30—August 17	17	661	95	2,660	10	687	122	4,008
(9) At Lang-tzu Shan, August 24-26	4	95	18	620	1	21	23	736
(10) At "Taamin" (An-ping), August 26	12	283	37	1,334	2	176	51	1,793
(11) At Liao-yang, August 27—September 3	87	2,030	444	12,999	10	1,464	541	16,493
(12) At the Sha-Ho, October 8-18	190	4,894	867	29,639	35	4,834	1,092	39,367
1905								
(13) At "Sandepu" (Hei-kou-tai), January 25-29	50	1,677	375	10,745	25	1,088	450	13,510
(14) At Mukden	257	8,448	1,491	49,947	280	27,929	2,028	86,324

* In the large numbers returned as missing are included prisoners, dead abandoned on the field of battle, and many sick and wounded cleared independently of the dressing stations of their own units.

† Apparently this is an error in the original, and should read "At Green Hills." The action may be described as the attempt to retake Chien Shan, originally held by the Russians as an advanced post of the "position of the passes."

The figures given in this table form the basis of the following calculations of the loss per 1,000 of strength in the units engaged in the actions mentioned :—

TABLE IX.

Actions	Per 1,000 of strength of units engaged in each action mentioned							
	Killed		Wounded		Missing		Total loss	
	Officers	Men	Officers	Men	Officers	Men	Officers	Men
(1) At Turenchen (Ya-lu) ..	120·4	49·3	175·9	94·4	18·5	41·2	314·8	184·9
(2) At the Kinjou positions (Nan Shan, Kuan-tung)	46·8	14·2	35·1	67·8	58·5	48·0	140·4	130·0
(3) At Te-li-ssu	26·2	15·5	142·4	62·9	14·5	18·1	183·1	96·5
(4) At the Green Hills (right flank of the position of the passes)	26·0	8·3	64·9	60·3	—	0·83	90·9	69·4
(5) At the "passes, Siaokaolin, &c." (position of the passes, Kuan-tung)	12·8	5·7	59·1	28·4	3·2	5·9	75·1	40·0
(6) At Ta-shih-chiao	5·5	5·5	50·9	28·2	4·1	4·2	60·5	37·9
(7) At Wolf Hills (Feng-huang Shan)	5·0	6·9	7·5	18·9	2·5	4·2	15·0	30·0
(8) At the passes, &c., (Yang-tzu-Ling, Yu-shu Ling, &c.)	13·3	9·5	74·1	38·1	7·8	9·8	95·2	57·4
(9) At Lang-tzu-shan*	7·6	3·4	34·3	22·0	1·9	0·75	43·8	26·1
(10) At An-ping*	21·8	10·4	67·3	48·8	3·6	6·4	92·7	65·6
(11) At Liao-yang	19·3	7·9	98·2	50·6	2·2	5·7	119·7	64·2
(12) At the Sha-Ho	31·3	13·9	142·9	84·2	5·8	13·7	180·0	111·8
(13) At Hei-kou-tai	22·3	16·5	167·0	105·9	11·1	10·7	200·4	133·1
(14) In the fighting at Mukden	35·0	23·0	202·8	136·1	38·1	76·1	275·9	235·2

* In the British official history of the war these are included in the account of the battle of Liao-yang, fighting against the Eastern group on the Russian outer line.

From these figures it appears that the total loss in officers, in the specified engagements, was proportionately from one and a half times to twice as great as the loss in other ranks, except in the action at the Wolf Hills, in which the loss in lower ranks was proportionately twice as great as in officers. Both in officers and men the most severe losses, proportionate to strength, were at Turenchen and Mukden.

The proportionate number of officers killed was from one and a half to three times as great as among other ranks, except at Ta-shih-chiao, where the losses in killed were proportionately equal, and at the Wolf Hills, where lower ranks lost more heavily in killed, even in proportion, than did the officers.

The number of officers wounded was proportionately from one and a half to three times as great as amongst lower ranks, except at the Kinjou positions and at the Wolf Hills, where the lower ranks lost proportionately about twice as many wounded as did the officers.

(3) Losses in Action according to Classification of Troops.

These are shown in the following manner :—

TABLE X.

Classification	Killed		Wounded		Captured		Total losses	
	Actual numbers							
	Officers	Men	Officers	Men	Officers	Men	Officers	Men
Infantry.. ..	740	22,591	3,480	133,322	772	48,420	4,992	204,333
Artillery ..	44	681	476	5,183	106	6,188	626	12,032
Cavalry	30	515	209	2,794	27	270	266	3,579
Engineers ..	6	58	20	444	3	925	29	1,427
Frontier Guards	11	125	17	386	4	428	32	939
Other troops ..	10	33	26	162	63	2,032	99	2,227
All branches	841	24,003	4,228	142,291	975	58,243	6,044	224,537

The loss per thousand by the different arms or branches, for units engaged, is shown as follows :—

TABLE XI.

Classification	Killed		Wounded		Captured		Total losses	
	Per 1,000 of strength of units, engaged in actions							
	Officers	Men	Officers	Men	Officers	Men	Officers	Men
Infantry	113·8	57·8	535·3	341·3	118·7	123·9	767·8	523·0
Artillery	32·4	11·9	350·8	90·9	78·1	107·8	461·3	210·6
Cavalry	31·75	19·4	221·2	105·4	28·5	10·2	281·45	135·0
Engineers	8·55	2·8	28·5	21·7	4·2	45·1	41·25	69·6
Frontier Guards ..	19·3	5·3	29·8	16·3	7·0	18·1	56·1	39·7
Other troops.. ..	15·55	3·15	40·4	15·5	98·0	194·2	158·98	212·9
All branches ..	78·44	45·37	394·36	268·97	90·94	110·1	563·75	424·44

If the proportional loss of the engineers (who lost least severely) be represented by unity, then the losses of other branches may be represented as shown in the following Table :—

TABLE XII.

Classification	Killed		Wounded		Captured		Total losses	
	Officers	Men	Officers	Men	Officers	Men	Officers	Men
Infantry	13·3	20·6	18·8	15·7	28·2	2·7	18·6	7·5
Artillery	3·8	4·2	12·3	4·2	18·6	2·4	11·2	3·0
Cavalry	3·7	6·2	7·9	4·8	6·8	0·2	6·8	1·9
Engineers	1	1	1	1	1	1	1	1
Frontier Guards ..	2·2	1·9	1·1	0·8	1·6	0·4	1·3	0·5
Other troops ..	1·8	1·1	1·4	0·7	23·3	4·3	3·7	3·1

(4) Concerning the Wounded.

Statistics regarding wounded are given in the following Table:—

TABLE XIII.

	Actual numbers		Per 1,000 — Of strength of troops engaged		Per 1,000 — Of mean strength of troops during of active operations	
	Officers	Men	Officers	Men	Officers	Men
Killed	841	24,003	78·44	45·37	57·06	36·55
Wounded	4,445	147,499	414·6	278·8	301·6	224·6
The number of wounded includes:						
Taken prisoners	217	5,208	20·24	9·84	14·72	7·93
Died with their units ..	29	458	2·7	0·86	1·97	0·70
Remained in fighting line ..	630	13,080	58·76	24·73	42·74	19·92
Taken over by (non-regimental) medical units	3,569	128,753	332·9	234·4	242·1	196·04
The number taken over by (non-regimental) medical units includes:						
Recovered	2,187	73,657	204·0	139·2	148·4	112·2
Died	232	5,270	21·64	9·96	15·74	8·02
Discharged as unfit.. ..	—	14,080	—	26·62	—	21·44
Evacuated to home territory	1,150	35,746	107·27	67·57	78·02	54·43
The number of wounded taken prisoners includes:						
Died	18	595	1·68	1·12	1·22	0·9
Of the number evacuated:						
Died	1	11	0·09	0·02	0·07	0·01
Discharged as unfit.. ..	—	14,278	—	26·99	—	21·74

Consequently, of the number of men wounded in action:—

	Per cent. — Officers	Per cent. — Men
Taken prisoners (Port Arthur figures excluded) ..	4·8	3·5
Remained in fighting line	14·2	8·8
Died (with their units, with medical units, or when prisoners of war)	6·3	4·3
Discharged as unfit	—	19·2

The following table affords information regarding those injured in action:—

TABLE XIV.

	Actual numbers			Per cent of strength of troops engaged			Per cent of total wounded and contused		
	Officers	Men	All ranks	Officers	Men	All ranks	Officers	Men	All ranks
Total wounded * ..	3,014	124,932	127,946	281·1	236·1	237·0	67·8	84·7	84·3
Total contused * ..	1,431	22,567	23,998	133·5	42·7	44·4	32·2	15·3	15·17
Of these:—									
Severely wounded and contused	1,093	50,002	51,095	102·0	94·5	94·6	24·6	33·9	33·7
Slightly wounded and contused	3,352	97,497	100,849	312·6	184·3	186·8	75·4	61·1	66·3

* See remarks by translator at end of article.

So it may be observed that, proportionately, contusions occurred among officers twice as frequently as among lower ranks.

Of the total number of officers wounded, one quarter were severely wounded.

Of the total number of men wounded, one-third were severely wounded.

(5) Regional Distribution of Wounds.

Among the total number of wounded (4,445 officers and 147,499 men), the wounds were distributed in regions as shown in the following table:—

TABLE XV.

Position of wounds	Per cent of number wounded in each category: Wounded by firearms			Wounded by other weapons			Total wounded		
	Officers	Men	All ranks	Officers	Men	All ranks	Officers	Men	All ranks
In head (and neck) ..	22·6	14·9	15·1	16·0	19·9	19·9	26·6	14·9	15·1
In chest and back ..	15·6	13·7	13·8	24·0	12·2	12·4	15·6	13·7	13·8
In abdomen (and pelvis)	4·2	3·6	3·6	16·0	4·3	4·4	4·3	3·6	3·7
In upper extremities ..	27·7	38·1	37·8	24·0	28·2	28·1	27·7	38·0	37·7
In lower ,, ..	29·9	29·7	29·7	20·0	35·4	35·2	29·8	29·8	29·7
Actual numbers wounded	4,419	145,347	149,766	26	2,152	2,178	4,445	147,499	151,944

Further particulars regarding a number of the 4,419 officers and 145,347 men wounded by firearms are given in the following table:—

TABLE XVI.

Position of wounds	Per cent of total number wounded in each category: By rifle fire			By artillery fire		
	Officers	Men	All ranks	Officers	Men	All ranks
In head (and neck) ..	13·9	12·1	12·2	46·9	19·6	20·4
In chest and back ..	12·0	14·2	14·2	8·3	11·3	11·2
In abdomen (and pelvis) ..	4·0	3·4	3·4	2·5	1·4	1·4
In upper extremities ..	32·6	40·1	39·9	19·0	38·3	37·7
In lower ,, ..	37·5	30·2	30·3	23·3	29·4	29·3
Actual numbers wounded	1,499	76,780	78,279	642	20,648	21,290

C. PARTICULARS OF LOSSES OF RUSSIAN AND JAPANESE ARMIES IN THE WAR 1904-1905 IN COMPARISON WITH STATISTICS OF FORMER WARS.

(1) Incidence of Disease and Deaths from Disease.

TABLE XVII.

	Actual numbers			Per 1,000 of strength			Percentage of deaths among sick in medical units
	Contracted disease	Died: Total	Died: In ambulances and hospitals	Contracted disease	Died: Total	Died: In ambulances and hospitals	
Russian Army, from Jan. 9, 1904, to October 14. 1905, in war with Japan	358,077	12,128	9,887	533·3	18·06	14·72	2·7
Japanese Army in war with Russia	334,073	27,192	21,802	513·9	41·8	33·5	6·6
Russian Army in war with Turkey, 1876-79	1,181,927	81,363	77,855	1,439·6	99·0	94·8	6·6
Russian Army in Crimean Campaign, 1854-56	351,622	88,798	80,687	879·0	221·9	201·7	22·9
German Army in war with France, 1870-71	208,280	12,466	12,054	234·6	14·0	31·6	5·8

This Table shows that the highest incidence of sickness, per 1,000 of strength, occurred in the Russian Army in the Turkish War (1,439·6 per 1,000), and the highest death-rate from disease in the Russian Army in the Crimean Campaign (201·7 per 1,000 of strength.)

The German Army is shown as being the most fortunate in regard to incidence of disease and death-rate from disease, but if the shortness of duration (seven months) of the Franco-German War is taken into consideration, a conclusion to this effect could by no means be arrived at. If average monthly sick rates be taken, another of the armies in the group above referred to is shown as having the lowest rates.

	Average per month per 1,000 of strength: Contracted disease	Died
Russian Army in war, 1904-1905	26·6	0·9
Japanese ,, ,, 1904-1905	24·4	1·9
Russian ,, ,, 1877-1878	51·4	3·5
,, ,, ,, 1854-1856	43·9	11·1
German ,, ,, 1870-1871	33·5	2·0

Consequently, the Russian and Japanese armies in the late war show the most fortunate results as regards incidence of disease; as regards death-rate, the Russian Army was the most fortunate.

As regards death-rate among sick in medical units, this was especially low in the Russian Army in the late war; being 2·15 times less than in the German Army and 2·44 times less than in the Japanese Army; not to speak of the Russian Army in the Crimean Campaign, in which the loss from death by sickness in medical units was 8·2 times as great.

(2) Losses in Action.

Losses in action in the late and former wars are shown by the following figures :—

TABLE XVIII.

	Actual numbers				Per 1,000 of average strength				
	Killed and died before being taken over by medical units	Wounded	Taken prisoners and missing	Died of wounds in medical units	Killed and died before being taken over by medical units	Wounded	Taken prisoners and missing	Died of wounds in medical units	Died per 100 wounded in medical units
(1) Russian Army in war, 1904-05	25,331	146,032	59,218	6,127*	37·7	217·4	82·2	9·1	4·19
(2) Japanese Army in war, 1904-05	47,387	173,425	6,700	11,425	72·9	266·8	10·3	17·6	6·58
(3) Russian Army in war, 1877-78	15,567	56,652	5,121	6,824	18·9	69·0	6·2	8·3	12·04
(4) Russian Army in war, 1854-56	24,731	81,247	7,430	15,820	61·8	203·1	18·6	39·5	19·47
(5) German Army in war, 1870-71	17,572	94,766	12,736	10,707	19·8	106·7	14·4	12·1	12·29

* Here are included those who died from wounds as prisoners of war—18 officers and 595 men.

The Japanese Army furnishes the highest actual and relative figures for killed and wounded, the Russian Army (in the late war) the highest for prisoners of war. The first result is accounted for by the stubborness of the fighting, the great numerical strength of the armies engaged and the long duration of the campaign ; the second result is partly accounted for by the large number taken prisoners at the capitulation of Port Arthur.

Of its own strength each army lost in killed and died from wounds :—

Russian Army in war, 1904-1905	.. ..	4·7 per cent.
Japanese ,, ,, ,, ,,	.. ..	9·0 ,,
Russian ,, ,, 1877-1878	.. ..	2·7 ,,
,, ,, ,, 1854-1856	.. ..	10·1 ,,
German ,, ,, 1870-1871	.. ..	3·2 ,,

The proportion of killed to wounded was :—

In Russian Army in war, 1904-1905	.. .. ..	1 : 5·7
In Japanese ,, ,, ,, ,,	.. .. ..	1 : 3·6
In Russian ,, ,, 1877-1878	.. .. ..	1 : 3·6
In ,, ,, ,, 1854-1856	.. .. ..	1 : 3·3
In German ,, ,, 1870-1871	.. .. ..	1 : 5·4

The proportion of killed and died of wounds to the total casualties in action (killed and wounded) was :—

In Russian Army in war, 1904-1905	.. .. ..	1 : 5·4
In Japanese ,, ,, ,, ,,	.. .. ..	1 : 3·7
In Russian ,, ,, 1877-1878	.. .. ..	1 : 3·2
In ,, ,, ,, 1854-1856	.. .. ..	1 : 2·6
In German ,, ,, 1870-1871	.. .. ..	1 : 4·0

The proportion of cases of disease to the total casualties in action (killed and wounded) was :—

In Russian Army in war, 1904-1905	.. .. ..	1 : 0·48
In Japanese ,, ,, ,, ,,	.. .. ..	1 : 0·66
In Russian ,, ,, 1877-1878	.. .. ..	1 : 0·06
In ,, ,, ,, 1854-1856	.. .. ..	1 : 0·30
In German ,, ,, 1870-1871	.. .. ..	1 : 0·54

The proportion of cases of death from disease and accident to the number of killed and died of wounds was :—

In Russian Army in war, 1904-1905	.. .. ..	1 : 2·60
In Japanese ,, ,, ,, ,,	.. .. ..	1 : 2·16
In Russian ,, ,, 1877-1878	.. .. ..	1 : 0·27
In ,, ,, ,, 1854-1856	.. .. ..	1 : 0·45
In German ,, ,, 1870-1871	.. .. ..	1 : 2·27

The proportion of deaths from disease in medical units to deaths from wounds was :—

In Russian Army in war, 1904-1905	.. .. ..	1 : 0·62
In Japanese ,, ,, ,, ,,	.. .. ..	1 : 0·52
In Russian ,, ,, 1877-1878	.. .. ..	1 : 0·09
In ,, ,, ,, 1844-1856	.. .. ..	1 : 0·19
In German ,, ,, 1870-1871	.. .. ..	1 : 0 88

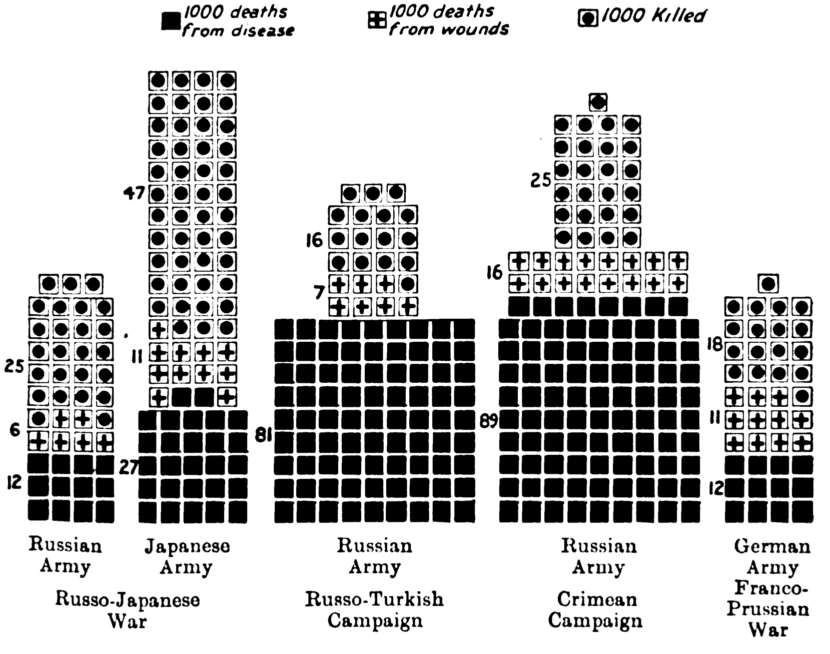
(3) "Complete" Losses (Killed and Died from Disease and Wounds).

TABLE XIX.

Armies	Killed and died of wounds, disease and accident		Mortality per 100 cases		
	Actual numbers	Per 1,000 of strength	Of wounds and disease	Severally	
				Of disease	Of wounds
Russian Army, 1904-1905 ..	43,586	64·86	3·17	2·7	4·18
Japanese ,, ,, ,, ..	86,004	132·30	6·55	6·6	6·58
Russian ,, 1877-1878 ..	103,754	126·0	6·84	6·6	12·04
,, ,, 1854-1856 ..	129,349	323·20	22·30	22·9	19·47
German ,, 1870-1871 ..	40,745	45·90	7·51	5·8	11·29

Consequently, the greatest "complete" losses were borne by the Russian Army in the Crimean Campaign. The highest percentage of mortality from disease and wounds are shown by the Russian Army in the Crimean Campaign and the lowest by the Russian Army in the Japanese War.

LOSSES FROM DISEASE AND WOUNDS IN WARS OF THE 19TH AND 20TH CENTURIES.



As to sickness the Japanese and Russian Armies in the war of 1904-1905 were the most fortunate (they had average monthly sick rates of 24·6 per 1,000 and 26·6 per 1,000 respectively): as to mortality from disease the Russian Army in the Japanese War was the most fortunate (deaths per 1,000 in an average month being 0·9); so also the Russian Army in the late war shows lowest mortality per cent of cases whether of disease or wounds.

NOTES BY TRANSLATOR.

Dates have been altered to new style. A few printer's errors in the original have been corrected according to the obvious intention of the author. The translation is abridged in certain unimportant particulars.

The term "officers" in the translation includes military officials ranking as officers, who are, in point of fact, officers of administrative services or departments.

In the original it is shown that the men "discharged as unfit" were dealt with under one or other of two headings (II. and III.) of the regulations governing discharge for unfitness. Under one of these headings men are given "prolonged leave of absence"; under the other they are found totally unfit for service. The numbers dealt with under each heading, respectively, are not given.

Russians (who may be considered somewhat precise in matters of terminology) use the equivalents of the words "wounded and contused" to describe casualties which we would include together under the general term "wounded." I have adhered to the literal translation only in Table XIV (and the remarks regarding that table), because here only is given specific information as to numbers "contused."

Reviews.

REPORT OF THE MEDICAL OFFICER TO THE LOCAL GOVERNMENT BOARD FOR 1910-1911.

The continued improvement in the public health of the country is a matter for congratulation on the part of the official staff concerned with its supervision, and also on that of the taxpayer, who reaps the benefit in the freedom from illness of himself and his household, and, as is well shown in the present report, in direct saving to his own pocket. The course of the general death-rate in England and Wales, which is stated by Dr. Newsholme at the commencement of his Report, has been steadily downward from 21·4 per 1,000 in the decennium, 1871-1880, to 15·3 in the decennium just completed (1901-1910); while in 1909 it was 14·5, and in 1910, the completed year under review, it fell to 13·5 per 1,000.

The first point dealt with by the Medical Officer is that of infant mortality. As to this he very truly observes that the study of its causes, and the means to be taken for its prevention, have now an added importance on account of the declining birth-rate. In 1871-1880 the death-rate of infants was 149 per 1,000 births; in 1901-1910 it had fallen to 127, and in 1910 we are told that it was 30 per cent lower than in 1901, but the actual ratio is not stated. The improvement of health in this respect, and in regard to the other diseases mentioned, is shown by diagrams, and stated as a percentage improvement. The diagrams "leap to the eye" in a very graphic manner, but they do not supply the place of the actual figures, the omission of which is to be regretted.

The average death-rate from enteric fever has declined from 33 per 100,000 of population in 1871-1880 to 9 per 100,000 in 1901-1910, and diminished 68 per cent between 1901 and 1910. This decrease in mortality has been almost uninterrupted since 1869; had the death-rate in the past year been the same as the average of 1871-1880, it is computed that there would have been about 11,800 deaths instead of 1,848, as was actually the case; this diminution implies that the cases of illness were some 70,000 fewer, and represents a money saving, as regards wages and expenses of illness, amounting to £1,260,000; and, as regards the capitalized value of lives preserved, a further saving of £1,492,800. This total saving of three millions sterling for one disease alone is to be set against the expenditure of some 60 millions out of local rates in England and Wales. The principal cause for this reduction

is considered to have been the general provision of public supplies of water, which have made water-borne enteric a rare occurrence, due allowance however, being made for the outbreaks at Worthing, Maidstone and Lincoln; it is noted that at Swanage, during 1910, there occurred twenty-four cases, confined to an area supplied with water from one particular source, a well near to leaking sewers; it is also noted that as far back as 1897, one of the Board's Medical Inspectors had pointed out the danger, and advised the discontinuance of this particular supply. Next in importance to a safe water supply Dr. Newsholme places the provision of a sewerage system, which (with a public water supply) permits of the substitution of water closets for pail closets or privies.

The average enteric death-rate in the seventy-seven great towns was 5 per 100,000; at Grimsby it was 22, and at Portsmouth 18, ingestion of polluted shell-fish being considered to have been the chief mode of infection; in Essex the number of cases per 100,000 of the population in 1891-1900 averaged 190 in the area bordering on the Thames, and 83 in the rest of the county. In 1906-1910 these figures averaged 34 and 21 respectively, showing that the Thames area is losing its character for enteric prevalence, owing (probably) to the abandonment of contaminated layings of shellfish. Certain localized prevalences in London were ascribed by Dr. Hamer to contaminated fried fish. At Eccles an outbreak of 142 cases occurred, of whom 101 had partaken of ice-cream, the majority of the cases being infected within a few days of each other. The ingredients of ice-creams in the process of preparation are partially cooked, and therefore, previously added infection would probably be destroyed; the pollution was probably introduced by infected hands or vessels, while the mixture was cooling. The report by Drs. Copeman and Delèpine is most instructive.

Scarlet fever has declined steadily from a death-rate of 72 per 100,000 in 1871-80 to one of 11 in 1901-10; in 1910 it was over 50 per cent lower than in 1901. It is said that there has also been a real decrease in the severity of the disease; this appears to mean a lessened fatality, due to greatly improved treatment in isolation hospitals, but the type of the disease is at present a mild one, and, as history shows, cyclical changes in severity occur, due (we suppose) to variation in virulence of the infection. The diminution in severity increases the difficulty of prevention of spread, as the disease is often not recognized, nor medical aid called in, sufficiently early. The Medical Officer notes "the apparent failure of means of notification, isolation and disinfection to secure such a reduction in scarlet fever as has been experienced in small-pox, typhus and enteric fever." Vaccination for small-pox, isolation hospitals for typhus, and improved sanitation for enteric have brought about a reduction in prevalence in these diseases, while the minute supervision needed to control scarlet fever and diphtheria cannot always be secured. In scarlet fever the specific organism remains undiscovered. Investigations have been undertaken by Dr. Gordon into the characters of the streptococci present in scarlet fever throats; those present in greatest abundance and most constantly, he found to be indistinguishable from *S. pyogenes*, as met with in other diseases; they are therefore not specific. "The control of scarlet fever will only be compassed when due regard is had to its natural history, and all means for its prevention are co-ordinated."

The death-rate from diphtheria shows a very marked improvement over that of the preceding decennium, when it was 26 per 100,000; in 1901-1910 it was 18, and in 1910 over 50 per cent lower than in 1901 (12 compared with 27); in 1871-80 it also averaged 12 per 100,000. A larger proportion of the total cases that occur are now notified than formerly, owing to the more general use of bacteriological methods of diagnosis; also the case-mortality, or fatality, is lowered, owing to the increased therapeutic use of antitoxin; both these factors complicate the question of variation in virulence. Every sanitary authority is now (since August, 1910) empowered to supply diphtheria antitoxin, and the necessary medical assistance in connexion with it, for the benefit of the poorer population; this authorization has been largely made use of.

Puerperal sepsis and the accidents of child-birth, which in the ten years 1897-1906 caused the death of one mother in every 228 births, in 1909 caused the death of only one in 270 births; the diminution has been greater in deaths due to sepsis than in those due to "accidents." There is a great difference in different parts of the Kingdom as regards this mortality from "accidents"; thus, in London it is 1·56, whereas in Westmorland it is 3·75 per 1,000 births (average of the period 1897-1908); the Home Counties generally furnish a low rate, while the highest rates are found in Westmorland, North and South Wales, Cumberland and Monmouth. The sepsis mortality varies from 0·73 in Huntingdon to 2·57 in South Wales. No complete explanation can be given of these variations, but the sparse population and difficulty of access of many of the districts (*e.g.*, Wales and Westmorland), compared with the greater facilities for institutional treatment &c. in London and its neighbourhood, may, in part account for the facts.

Measles and whooping-cough are chiefly diseases of childhood; "in no sanitary district up to the present time can they be said to have been controlled"; the occurrence of an epidemic depends, apparently, on the accumulation of susceptible children under conditions favouring infection; in large towns epidemics occur almost regularly every second or third year, the epidemics vary in severity and fatality. The decennial average death-rates for measles have been 38, 44, 41 and 31 from 1871 to 1910; for whooping-cough the figures have been 51, 45, 38 and 27; in the year 1910 the measles death-rate was 17 per cent, and the whooping-cough death-rate 22 per cent, below that for 1901, but the Medical Officer points out that, though there has been a definite decline in mortality from whooping-cough, the same cannot be stated as regards measles, in proportion to the infantile population, but a smaller proportion of children under 5 years of age are now attacked. An exceptionally severe outbreak of measles occurred in London early in 1911, and accommodation was afforded for large numbers of cases in the hospitals of the Metropolitan Asylums Board.

The small-pox death-rate has fallen from 25 per 1,000 in 1871-1880, to 1 per 1,000 in 1901-1910, the same proportion as in the decennium, 1891-1900. The ratio for 1910 is not stated, but the total number of deaths was nineteen. An account is given of the Stepney outbreak in the early part of 1911, and of the difficulty of arresting the progress of an epidemic, which however was successfully accomplished. The four main lines of action required are: (1) Prompt recognition; (2) immediate

removal to hospital; (3) tracing and daily surveillance of all known contacts: (4) vaccination or revaccination of these contacts.

"A number of small outbreaks of cerebro-spinal fever (*i.e.*, inflammation of the membranes covering the brain and spinal cord, caused by the invasion of the meningococcus), and of poliomyelitis (*i.e.* inflammation of the spinal cord caused by an unknown virus) have occurred in recent years in England and Wales." Probably the deaths from cerebrospinal fever are understated, owing to the difficulty of distinguishing an attack from other forms of meningitis; in 1909 there were 130 deaths recorded as from this cause, a greater number than in any other year of the decennium. The deaths from poliomyelitis are not at present completely certified, and are not separately tabulated. During the year several groups of cases occurred in different parts of the country, as at Maryport, Carlisle and Cerne Abbas; there was also an outbreak of disease of the nervous system in Nottinghamshire and Lincolnshire, amounting to eighty-three cases, some apparently being cerebrospinal meningitis, others poliomyelitis.

The death-rate from pulmonary tuberculosis has fallen from 219 per 100,000 in 1871-1880, to 117 in 1901-1909; comparing 1901 with 1909, the death-rate has dropped 14 per cent. For tuberculosis other than pulmonary the mortality has fallen from 67 in 1871-1880, to 50 in 1901-1909; comparing 1901 with 1909, the reduction was 19 per cent. This steady decline is especially of importance, as already mentioned, because the disease mostly prevails during the working years of life. Dr. Newsholme, after consideration of the historical and geographical evidence, ascribes the decline to an improving social and sanitary condition of the people; better housing, less unhealthy conditions of occupation, more wholesome and more abundant food and clothing, have combined to produce increased resistance to tuberculous infection; "they have probably even more ensured diminished facilities for infection. . . . Improved housing doubtless increases the resistance to tuberculosis; still more, it implies diminished opportunities for infection." This results (1) from greater separation of sleeping accommodation; (2) improvement of habits, *e.g.*, diminution of spitting, increased cleanliness, reduction of bugs; (3) more complete dissociation of sick from healthy; in 1910, in London, over 56 per cent of male deaths, and over 45 per cent of female deaths from phthisis occurred in public institutions, the patients having been inmates during the most serious period of the sickness. These facts explain how it is that the consumption death-rate has declined as much in towns as in rural districts, and that the urban (114) is falling to the rural rate (104 per 100,000.) "The largest amount of infective material is expectorated by the patient in the later stages of his illness, and it is in this part of his illness, in the absence of skilful nursing, that the weakened patient is most likely to fail in the simple hygienic precautions needed to safeguard those about him." Early treatment in a sanatorium (which depends on early recognition of the disease) gives the best prospect of recovery. An increase in the number of sanatoria is expected, "if and when the Insurance Bill becomes law," and this will lead to early recognition of the disease. During 1911, regulations have been issued, extending those of 1908 (which made compulsory the notification of cases of consumption under the care of poor law medical officers) so that *all* cases of pulmonary

tuberculosis coming under medical care at charitable hospitals and dispensaries are now notifiable, and full powers are given to sanitary authorities to help the patient with a view to preventing spread of infection. The importance of this advance in preventive medicine is very great.

An account is given of the small outbreak of "possible plague" in East Suffolk in October, 1910; the cases were notified as "pneumonic plague," and though the bacteriological diagnosis was not confirmed by inoculation tests, the Medical Officer considers that they may have been plague, as well as two previous limited outbreaks in the same neighbourhood. The introduction probably took place by means of infected rats imported with foreign grain coming from plague-infected countries; but it is considered that there is no need for any more stringent regulations for ships than those contained in the Paris International Sanitary Convention of 1903. An important point is that the possibilities of spread from rat to man are much less in this country than in India; few houses are rat-infested; our rat is the brown (*Mus decumanus*), not the black (*M. rattus*); it is not a domestic animal; its fleas are less numerous, and are not so prone to bite man; they are almost entirely *Ceratophyllus fasciatus*, and *Ctenophthalmus agyrtes*, neither the rat flea of India (*Xenopsylla cheopis*) being found, nor *Pulex irritans*, the human associate.

Much valuable work has been done in the department of food inspection, now under the charge of Dr. MacFadden; the general improvement in the condition of foods arriving at our ports from abroad since the passing of the Regulations as to Food Act of 1907 has been maintained, and experience shows the value of the administrative measures in preventing unsound or unwholesome foods from reaching the consumer. Some outbreaks of food poisoning have occurred during the year, but none of any great importance. The Report of the International Conference on Unification of Methods of Analysis for Alimentary Substances (Paris, 1910) is given in full, and is of interest to all concerned. We notice that results of analysis, for substances measured by weight, are to be stated as grammes, or as milligrammes, per 100 grammes, *i.e.*, parts per cent, or parts per 100,000; for substances measured by volume the results are to be given as grammes, or as milligrammes, per litre; *i.e.*, parts per 1,000 or parts per million. There are thus four different methods of statement officially authorized; this appears to be confusing, and perhaps is the result of a compromise; percentages for gross analyses, and millesimal percentages (*i.e.*, parts per 100,000) for minute ones, would, in the opinion of some, satisfy all reasonable requirements.

Among special subjects considered by the Board during the year is the important one of tenure of office by Medical Officers of Health; a new order has been issued, under which the practice of re-appointment annually will cease, and an officer appointed for a specified term will, on its expiration, continue to hold office indefinitely, subject to three months notice. Under a new regulation medical officers of health are to notify immediately to the Board any case of plague, cholera or small-pox, or any serious outbreak of epidemic disease; also to send a weekly statement of the number of cases. Another great improvement in procedure has been in operation since the beginning of 1911; the Registrar-General now publishes vital statistics for administrative areas, that is, the same areas as those for which statistics are compiled by medical officers of health.

All deaths occurring in institutions are now also relegated to the districts "in which the deceased had a fixed or usual residence at the time of admission to the institution"; hitherto this transference has not been carried out systematically, now it is definite and universal. The definition of a transferable death is "a death of a person who, having a fixed or usual residence in England or Wales, dies in a district other than that in which he resided." The Registrar-General undertakes to supply every medical officer of health with particulars of deaths of residents not registered in the district. There must be some time-limit, but we are not told what it is; obviously the death of an inhabitant of one district, who is an in-patient of a hospital or asylum, or making a prolonged visit, in another district, and there dies of some acute infection after several weeks or months sojourn, should not be debited to the district of permanent residence.

The only melancholy reading in this report is the part referring to vaccination; the exemptions during 1909 increased to 21·6 per cent of births; in 1902 they formed only 3·6 per cent; in 1907 they were 8·4; in 1908, 17·0 per cent. The considerable increase has been obtained, as pointed out by the Medical Officer, at the expense of children who in the past would have been vaccinated. Combustible material is being accumulated in rapidly increasing quantity; wilful ignorance and prejudice flourish, and are allowed to have their way at the expense of the helpless infants. The Stepney outbreak already referred to was a warning; of 41 cases among vaccinated persons two died; of 13 cases among unvaccinated, six died. The handwriting on the wall is clear enough for those who have eyes to see, or rather, who are not wilfully blind.

The chief scientific investigations of the officers of the Board, apart from those carried out in relation to epidemics, have been on the causation of infantile diarrhœa, on flies as carriers of infection, on the bacteria in the air of drains and sewers, and on secondary infection in pulmonary tuberculosis. The first inquiry was conducted by four observers working independently in London, Birmingham, Manchester, and Shrewsbury; this year's work was devoted to research on the bacterial flora of the child's intestinal tract, and especially the group of aërobic bacteria that do not liquefy gelatine, nor ferment lactose. These organisms were found with much greater frequency in the fæces of children suffering from diarrhœa than in those of healthy children; the inquiry is being continued. Four reports have been issued on flies, containing much valuable information: the exact share borne by flies in carrying the infection of epidemic diarrhœa cannot yet be stated, but for practical purposes "the number of flies in the summer months may be regarded in towns as a valuable index, under present conditions, of the possibilities of contamination of food by pathogenic microbes or by decomposing organic matter; especially in districts in which privies and pail closets persist, and in which accumulations of house refuse or stable refuse are permitted." It is at the same time urged that it would be a mistake to assume that epidemic diarrhœa prevention is limited to fly destruction, personal cleanliness on the part of whoever prepares the infants' food, and cleanliness of the house and its surroundings are also requisite.

Dr. Andrewes, continuing his previous investigations, has shown that typical sewage bacteria can be readily demonstrated in drain air under

favourable conditions, but the number is so small as to be insignificant; by splashing, such bacteria can be disseminated in the air of a drain or inspection chamber, or ventilating shafts, with the aid of air currents; such splashing is infrequent in sewers, and sewer air is seldom found to contain sewage organisms; splashing is more common in drains and inspection chambers, and in the air in such situations sewage bacteria are often present. Dr. Andrewes recovered test microbes from the top of ventilating shafts, 73 feet above the floor of the inspection chamber. Sewage bacteria, and therefore pathogenic germs in sewage, may be disseminated through the air of the drains and inspection chambers and ventilating shafts, provided there be splashing and movement of the air. These experiments corroborate those of Colonel Horrocks and other observers previously recorded. "As regards the infection of the drain air of a house by microbes derived from a sewer, in the absence of an intercepting trap, the determining condition would appear to be the degree of infection of the sewer air. . . . Microbes derived from sewage may pass into the air of the house drains under natural conditions of sewage flow, but the number of such microbes demonstrable there is not large, and in the majority of cases they are not demonstrable at all." The test organisms were present in the sewage in enormous numbers, far exceeding any likely content of pathogenic bacteria. It is concluded that these considerations "must very largely discount any possible chance of harm arising from the escape of sewage bacteria into house drains, even when no trap is present." We believe this to be a fair statement of the case, but we are none the less convinced that the disconnecting trap is a sanitary necessity, and that every householder should see to the good order of his own drains.

This fortieth Annual Report of the Local Government Board's Medical Officer is of exceptional interest in many ways; considerations of space have limited our notice to but a few out of many points that invite attention. The Board has sustained serious loss by the retirement of Dr. Franklin Parsons, whose encyclopædic knowledge is only equalled by his kindness and willingness to help all who apply to him for information. The much regretted death of Dr. Timbrell Bulstrode leaves a sad gap at the Local Government Office, at the Royal Society of Medicine, and in a large circle of personal friends in all parts of the country.

A. M. D.

TROPICAL HYGIENE FOR ANGLO-INDIANS AND INDIANS. By the Honourable Surgeon-General C. P. Lukis, M.D., F.R.C.S., C.S.I., Director-General of the Indian Medical Service, and Major R. J. Blackham, R.A.M.C. Calcutta: Thacker, Spink and Co. 1911. Price 4s. 6d.

This book is intended as an advanced manual for the Senior Certificate in Home Hygiene of the St. John Ambulance Association, and is written for Anglo-Indians and Indians. In an appendix the syllabus of the course is given, which explains to some extent the object of the present volume.

Taking the book as a whole, it appears to be well suited to the requirements laid down by the Committee of the Indian Branch. The principal facts in connection with communicable diseases of the Tropics are clearly explained and the chief points suitably enlarged upon. One of the best chapters in the book is that devoted to insects and disease in

the Tropics, and makes very interesting reading. For a somewhat inexhaustible subject, it has been treated in a sound and skilful manner. The chapters on food and ventilation fall a little short in value, being in places hardly up to date. The authors have evidently not consulted the valuable report on ventilation issued by the Home Office, or the recent work of Haldane and others, as sufficient stress is not laid upon humidity, temperature, and the relation of the wet bulb thermometer as causes of the ill-effects of badly ventilated rooms.

The term "proteid" is retained throughout the chapter on foods, and is apt to be misleading. The nomenclature of the proteins as laid down by the Chemical and Physiological Societies has now been fully recognized and accepted among scientists. We notice that the cult of Mr. Fletcher has been taken seriously and we are told in a summary of Fletcherism, "to wait for a true appetite." Many of us might possibly wait a long time. The authors consider that afternoon tea is an unnecessary and useless meal; this is evidently only meant to apply to warm climates and deserves consideration.

Among the rules given to escape dysentery, we notice that tinned foods are to be avoided. As the disease is shown to be due either to a bacillus or amœba, there is probably here some confusion with ptomaine or nitrite poisoning.

There are various ways of writing popular books on scientific subjects, but we must confess that the method adopted by the authors of interlarding their manuscript with quotations and sayings of various individuals is apt to be somewhat wearisome. The book would have been far more valuable if the authors had given more from their own experience on Indian sanitation. The term "an American professor, called Chittenden" is rather a doubtful compliment to a scientist of such world-wide fame. The illustrations accompanying the text are in most places clear, and should serve their purpose well, but that on p. 52 is rather out of date.

W. W. O. B.

Current Literature.

Report on Laboratory Work, &c., in the Windward Islands (Abstract).—Dr. Lucius Nicholls reports a number of very interesting observations having a practical bearing on tropical sanitation. Among the more important are the following:—

Ulcer-fly.—This is a small acalyptrate muscid, which is found in great numbers hovering round and feeding on the discharges of any ulcer or abrasion present on the skin. Dr. Nicholls describes the extraordinary persistence with which these flies will pursue any person who has an exposed sore, and he suggests that they may frequently act as mechanical spreaders of wound infections, including yaws.

Malaria Preventive Measures.—In this he describes practical attempts to stock pools, gutters, streams, &c., with the little fish, "millions." They do not thrive in places where they are exposed to rapid changes of temperature and to the direct rays of the sun, nor do they thrive in iron

tanks; but they can be kept in wooden barrels for stock purposes and quantities baled out as required. In some of the places tried, the "millions" did not multiply until the mud-fish, crustaceans and other enemies, were killed off by cyllin, the "millions" being placed in the waters so treated after the first succeeding rain had washed out the poison. Swamps containing innumerable water-holes, which dry up partially from time to time, are not suitable for the little fish, but apart from these points the experiments gave very promising results, and the author is of opinion that the use of the fish is superior to the employment of petroleum. A practical point in the clearing of the edges of rivers and ravines is, that it is mostly called for in the dry season, as in the rains, when these water-courses are running full and fast, mosquitoes do not breed in them. Experiments on the breeding-places of mosquitoes again showed the fact that places which are suitable for one genus are entirely unsuitable for another. In connection with *Stegomyia fasciata* he frequently found the larvæ in screened tanks, these had bred from eggs deposited in small quantities of water lying in the troughs supplying the tanks; the mosquitoes so hatched were able to escape through a net with 40 meshes to the inch, though most of them died afterwards. The remedy consists in having well-laid gutters or in perforating the gutters with fine holes which will not interfere appreciably with their action as gutters, but will prevent any stagnation of water in them.

Ankylostomiasis.—Experiments with ova and larvæ showed, among other things, that they were extremely susceptible to drying, heat, or the sun's rays. For example, small blocks of fæces ½-inch in diameter were exposed to the sun, all ova were destroyed in five minutes, and exposure of ova to a temperature of 105° F. for one minute was sufficient to destroy them. Dr. Collins is of opinion that most of the severe cases of ankylostomiasis are caused by constant re-infection of the patient from the habit of always using the same place in the bush for defæcation. He shows that dogs infected with ankylostomiasis die in about two months if they are kept chained, the reason being that the ground on which they are chained becomes intensely infected with larvæ; after death the dogs were found to be swarming with the worms, control dogs allowed to run free showed no increase in the amount of infection.

Natural Enemies.—Dr. Nicholls proposes and is carrying out experiments on the natural enemies of various pests. He points out the great importance of studying the effect of introducing "natural enemies" into a country very carefully before actually importing and using them, lest, as has frequently happened, the cure be worse than the disease.

W. S. H.

Sanitation—Canal Zone.—(Extract from the "Report of Department of Sanitation, Isthmian Canal Commission, September, 1911.")

"*General Sanitation.*—The swampy area north of Ancon has been drained, and future anopheles-control costs in that vicinity will be reduced thereby. The fill in the forty-acre swamp, recently made at Balboa, is advancing rapidly, and in about seven months will probably eradicate this anopheles-production area completely. At the present time the swamp is being controlled by means of two small oil-tank boats supplied with spraying apparatus. There has been an increase of anopheles in this vicinity, but the destruction of adult *Anopheles albipes* in barracks enables us to control malaria fairly well." . . . .

"*Antimalaria Work and Malaria.*—The destruction of adult anopheles that enter barracks is carried on daily. In badly-infected sections such work is performed twice daily, once at about 8 a.m., and again in the afternoon. It has been noted that where anopheles traps are installed in the ventliators near the galvanized-iron roof, the number of anopheles albapies that actually enter the building is then only from 10 to 25 per cent of the number found when these traps are not used. It should be noted that traps are useful only when placed on the lee side of the building. Also that the destruction of adult anopheles in barracks is much more perfect when the walls are painted a light colour. That work of this class is useful there can be no doubt. For instance, at Corozal is a barrack building containing from 90 to 120 labourers. So far, this year we have destroyed 19,284 anopheles at this building. There have been only twelve cases of malaria during the past nine months among these men, although anopheles were plentiful, and infected labourers living near by. . . .

Months	Anopheles destroyed by traps and by hand at building No. 6 Corozal	Cases of malaria
1911		
January	3,484	2
February	5,262	—
March	2,323	2
April	1,310	1
May	3,846	2
June	1,944	2
July	673	2
August	187	1
September	255	—
	19,284	12

"During the past nine weeks, with one exception, the malarial sick-rate has been lower than during the corresponding weeks of any previous year."

The Variety of the Tubercle Bacillus in Phthisis. — Kossel (*Deut. Med. Woch.*, October 26, 1911, p. 1973) defines the human type of tubercle bacillus as giving an abundant growth on glycerin serum and in glycerin broth. The microscopical appearance of the former culture is that of slender evenly-stained rods, and the latter that of not very long, often bent, bacilli. One cg. of the culture inoculated beneath the skin of a rabbit causes no general infection in three months. The bovine type develops much more scantily both on glycerin agar and in glycerin broth. It may produce a membrane-like layer with here and there warty excrescences. On the serum plump short forms, and in the broth rods of unequal length, which stain irregularly, sometimes as rows of dots, are found. One cg. of the growth causes generalized tuberculosis in the rabbit within a few weeks; 5 cg. are sufficient to cause a general infection in the calf. Kossel has investigated the variety present in the sputum of forty-six phthisical patients. He isolated the human variety in forty-five. Both were found in the sputum

of the remaining case. Möller has ascertained from published accounts that in 709 sputum cultures of the tubercle bacillus, the human type has been obtained 705 times, the bovine three, and both once. Hence consumption spreads from man to man.

C. B.

Early Diagnosis of Lung Tubercle. Presuhn (*Veröffentlichungen aus dem Gebiete des Marine-Sanitätswesens*, H., 2, 1911).—Before tubercle bacilli can be detected in the sputum, the presence of from 33 to 90 per cent lymphocytes is suggestive of phthisis, although this is not an absolutely specific sign. An irregular rectal temperature is suspicious: dyspepsia and a quickened pulse may be the first indications of a tuberculosis. Arloing's agglutination test of the blood serum, the complement deviation method, and Calmette's cobra-venom reaction are not reliable for the recognition of incipient phthisis. For this purpose the hypodermic injection of ½—1 mg. of Koch's old tuberculin gives the most reliable evidence. Koch's old tuberculin is a glycerine extract of an eight weeks old culture of the tubercle bacillus in glycerine peptone broth. It is filtered and reduced to one-tenth its original bulk. A convenient dilution, which should be freshly prepared, is made by adding 0·01 grm. tuberculin to 9·99 grm. of 0·5 per cent phenol watery solution. Hence 1 c c. of this will contain 1 mg. of tuberculin, which is a suitable dose for an adult. If the patient be tuberculous a reaction will follow within forty-eight hours, shown by a rise of temperature of 1°—2° F. accompanied by feverish symptoms. In case of doubt, a second dose of twice the quantity should be given four or five days later. In the great majority of instances a reaction will be observed if tubercular infection be present. Lawrason Brown, however, has recently stated that failure to react to 10 mg. of tuberculin, on rare occasions, does not exclude tubercle. Presuhn holds that healthy and tubercle-free people give no response with 5 mg. of tuberculin. The test fails in advanced phthisis, tubercular peritonitis and miliary tuberculosis. The safety of the procedure is well established. Freymuth has administered more than 10,000 injections, Moeller over 30,000, without accident. The contra-indications against its use are, a recent hæmoptysis, organic disease of the heart, pyrexia, epilepsy, renal disease and debilitated conditions after severe illnesses.

V. Pirquet's skin reaction discloses not only active but latent tubercle. Ninety per cent of adults react, hence a positive response is of no clinical significance. On the other hand, a negative result almost certainly excludes tubercular infection, except in the conditions noted above where the injection method fails.

Calmette's ophthalmic test is best made by instilling into the conjunctival sac a minute drop of a freshly-prepared 1 in a 100 dilution of Ruete-Enoch's (Hamburg) tuberculin. Calmette's "tuberculin test" is ten times stronger than this dilution, and has given rise to severe conjunctivitis when the drop instilled has exceeded $\frac{1}{200}$ c.c. in amount. This test gives a positive response in 90 per cent of cases of undoubted tubercle, and in 55 per cent of suspected. The reaction may occur in the non-tubercular if tuberculin has been administered subcutaneously, or has been applied to the eye some time previously. It has also been observed in enteric and rheumatic fevers. It remains negative in advanced

tubercle, in tubercular meningitis and in miliary tuberculosis. It is a harmless procedure if these precautions are taken: (1) Avoiding too large a dose for instillation; (2) noting the absence of acute or chronic eye affections, especially tubercular; (3) never employing it after tuberculin injections, nor after a former instillation. Calmette's reaction is the next best test to the injection method for the early recognition of tubercle.

Escherich's puncture test resembles v. Pirquet's, except that the tuberculin is injected into the skin by means of a sharp canula. It suffers from the same disadvantages as v. Pirquet's method. Moro's percutaneous reaction consists in the inunction of an ointment containing 10 c.c. of old tuberculin to 10 grm. of lanolin, a characteristic inflammatory zone indicates a positive response. Fifty per cent negative results have been observed in the tubercular, hence it is of little value.

X-Ray diagnosis: Presuhn states that the skiagram is of great aid in the detection of early phthisis, miliary tuberculosis, and tubercular mediastinal glands. Under examination with the screen Williams' sign—diminished movement of the diaphragm on the side of the tubercular infiltration—may be observed in 50 per cent of early cases. It must be remembered, however, that pleuritic changes of any kind may evoke this sign. C. B.

Methods of Tubercle Detection.—Roepke (*Deutsch. med. Woch.*, October 19, 1911, p. 1937) has examined Much's method of sputum staining, which consists in leaving the films in aniline-genetian-violet for forty-eight hours and then treating with Gram's fluid. By this means non-acid-fast forms of the tubercle bacillus, which fail to retain the dye under Ziehl's process, may be seen. They usually appear as rows of dark granules or dots, which must not be confounded with soot-particles. In several hundred comparative experiments Roepke ascertained that when tubercle bacilli were found Much's dots could be seen in the specimen stained by Gram. In 12 per cent of tubercular sputa Much's forms alone could be detected. Consequently he recommends that in all cases of suspected phthisis, in which no tubercle bacilli can be found by the usual method, an examination of slides for Much's granules should be made. Arloing's agglutination test gives positive results in 70 per cent of all adults. The complement deviation method shows the presence of specific antibodies in the serum of the healthy and in the tubercular.

Roepke regards the determination of the fluctuations of the opsonic index as being too difficult and laborious. Calmette's cobra-venom test he finds unreliable. He states that the subcutaneous injection of tuberculin affords the sovereign means for detection of incipient tubercular infection. He has a poorer opinion of Calmette's ophthalmic reaction for early diagnosis, since he has had 50 per cent failures with it. He speaks guardedly on the certainty of interpreting the skiagraphic appearances of initial lung tuberculosis. C. B.

The Treatment of Surgical Tuberculosis with X-Rays.—Baisch (*Münch. med. Woch.*, October 10, 1911, p. 2188) states that X-rays benefit the fungus forms of tubercle of the smaller bones and joints, tubercular fistulæ and tubercular glands and tubercular peritonitis. In combination

with limited operations and tuberculin injections the results are still better.

Wilms also is in favour of X-ray and tuberculin therapy.

Lenzmann claims good results from injections of a mixture of tuberculin and liquid paraffin into the tubercular foci, if situated on the hands or feet, in conjunction with Bier's treatment. C. B.

Tubercle of the Kidney.—Israel (Kongress der deutsch. Gesellsch. für Urologie.—*Münch med. Woch.*, October 10, 1911, p. 2193) advocates nephrectomy as soon as the diagnosis of tubercle of the kidney has been made. Even if only a small tuberculous focus is found the organ must be extirpated. He has examined the records of 1,023 cases treated surgically, the mortality of which was 25 per cent within six months. It is higher in men than in women. The fatality of tubercle of the kidney under expectant treatment exceeds this. Collapse and nephritis are the chief immediate causes of death after operation. Later a general tubercular invasion may be feared. This contingency is four times as frequent in men as in women. The chances of complete recovery of those who survive the second year are good. Thirty-six per cent of late deaths are due to non-tubercular kidney disease, nephritis, or stone. Tubercle of the remaining kidney may sometimes supervene. Nevertheless, there are four recoveries recorded where this occurred. Hence the condition is not quite hopeless. Tubercle bacilli may be detected in the urine in about a quarter of the cases after operation. Only 23·5 per cent of all cases subjected to operation recover perfectly. Israel thinks that tuberculin therapy in renal tuberculosis is without value.

Wildbolz analysed the reports of 316 cases of renal tuberculosis and found that 70 per cent of those treated medically died for the most part within a year. Only 20 per cent survived five to ten years. Thirteen individuals suddenly succumbed to uræmia, although they had been apparently in good health for several years. A few recovered with the kidney and ureter completely disorganized. This may be called "auto-nephrectomy." Wildbolz's operation statistics gave a 2.1 per cent early and a 25 per cent late mortality. The results were more favourable in women than men. He could observe no permanent benefit from the administration of tuberculin.

Zuckerkandl urged early operation. His mortality was 19 per cent, though in his last fifty nephrectomies it had fallen to 1 per cent.

Bachrach and Necker, from a study of twelve cases, think tuberculin therapy is suitable for those in which tubercle bacilli, but no pus, are found in the urine. Tuberculin is also valuable after operation. In advanced tuberculosis of the kidney its effect is not marked.

C. B.

Vaccine Treatment of Gonorrhœa.—Schmitt (*Münch. med. Woch.*, October 10, 1911, p. 2156) has employed vaccine therapy in twenty-four cases of gonorrhœa of the cervix uteri. Although he at first looked upon this mode of treatment with great scepticism, yet he became convinced that twelve of these women were cured by the inoculations. The duration of the disease was from three to seven weeks, which is shorter than when treated by other methods. Examinations conducted immediately after

menstruation, four to ten weeks later proved the absence of gonococci. He thinks that vaccine therapy is indicated in chronic gonorrhœal infections, vulvo-vaginitis of children, and in cervical inflammations. It is also of use in epididymitis, prostatitis and spermato-cystitis, and in some cases of gonorrhœal rheumatism. Urethritis is not modified by it.

C. B.

Appendicitis.—Gumbel (*Deutsch. Zeitsch. f. Chirurg.* 110, Bd. 4-6) gives the statistics of 236 cases of appendicitis subjected to surgical interference. The mortality amounted to 9·7 per cent. The death-rate of those on whom an operation was performed within the first forty-eight hours, if no peritonitis was present, was *nil*, if peritonitis was found, then 9 per cent was the ratio of mortality for the first day and 14 per cent for the second day. The fatality of cases without peritonitis treated surgically on the third day was 20 per cent, with peritonitis, 23 per cent. That of peritonitis operated on the fourth day or later was 50 per cent. The mortality of the intermediate stage operations was 18 per cent. That of internal operations *nil*.

C. B.

The Abortive Treatment of Syphilis.—Hecht (*Deutsch. med. Woch.*, November 2, 1911, p. 2039) treats primary syphilis by excision of the chancre and enlarged glands, the intravenous injection of 0·4 to 0·6 gr. salvarsan followed by a course of calomel injections and a final dose of salvarsan. The treatment lasts for five to seven weeks. In twenty-six cases, watched for four months or more, there have been twenty-two successes and four failures. One of the latter developed severe tertiaries, notwithstanding two doses of 0·5 gr. of salvarsan, calomel injections and two courses of inunction.

C. B.

Re-infection after Salvarsan.—Klausner (*Münch. med. Woch.*, October 31, 1911, p. 2335) refers to the report by John who has collected accounts of 356 instances of alleged re-infection after cure by salvarsan, 119 of which satisfy the most critical examination. He now records a case of secondary syphilis to which 0·6 gr. salvarsan was given intramuscularly. A cure resulted with a change of the Wassermann reaction from positive to negative. A year later the patient again appeared with a hard sore from which the *Treponema pallidum* was obtained. Secondaries came on and the serum test once more became positive.

C. B.

Salvarsan in Malignant Disease.—V. Zeissl (*Berliner klin. Woch.*, November 6, 1911, p. 2017) has given salvarsan in a case of inoperable sarcoma with improvement in the general health.

Salvarsan, Treatment by.—Klingmüller (*Münch. med. Woch.*, October 10, 1911, p. 2146) has administered salvarsan to 923 patients, and has given 912 intravenous injections. He has found that it is a safe remedy with reasonable precautions, and that it cures early cases quickly and lessens the risk of infection. In most individuals salvarsan plays the part of a tonic. It has not the depressing effect of mercury. The earlier the stage of the disease the better it acts. It is well to begin with a dose of 0·3—0·4 grm. given intravenously, followed by another of 0·5—0·6 grm.,

and afterwards by a course of mercurial injections—calomel by preference. He states that under such combined treatment the Wassermann reaction after five months is negative in 75 per cent of cases.

Nonne (*Berliner klin. Woch.*, November 13, 1911, p. 2091) thinks that salvarsan is contra-indicated in luetic lesions near vital parts, and that it is no more powerful than mercury and iodides in cerebral syphilis, and in converting the Wassermann reaction from positive to negative.

Oppenhein has watched the effects of salvarsan in twenty-two cases of cerebral syphilis, forty-four of locomotor ataxy, twenty-one of general paralysis of the insane, and in five other nerve lesions. He concludes that it possesses no advantage over mercury and iodide. In tabes and general paralysis its influence may be harmful, the progress becomes more rapid and new symptoms may arise; hence he considers it contra-indicated in these diseases. He considers it has no effect on meta-syphilitic degenerations. He holds that the Wassermann reaction is no indication for treatment.

Finger energetically affirmed his opinion that the nerve complications, which sometimes come on six to eight weeks after salvarsan, are intimately connected with the substance. He stated that in the pre-"606" era he observed only five such complications in 2,000 cases of syphilis, whereas 7 per cent of salvarsan patients present these sequelæ, if they are watched for a year or more. He alleged also that "606" excites latent tubercle and provokes endarteritis of the cerebral vessels.

Kren opposed Finger. He had seen nerve sequelæ seven times only in 435 patients treated with salvarsan.

Schwarz thought from his experience that the action of salvarsan in cerebrospinal syphilis surpassed that of other remedies, and that any such complications are not caused by it.

Treupel has observed that salvarsan relieves the lightning pains and lessens the ataxy of tabetics, though an exacerbation of the former after an injection is so constant that he regards it as a characteristic nerve reaction. This lasts for about twenty-four to thirty-six hours, after which the pains disappear and do not recur for a long period. In general paralysis of the insane, speech and co-ordination are improved by "606." Unfortunately, in neither condition is the amelioration permanent.

C. B.

Severe Symptoms after Salvarsan.—Voss (*Münch. med. Woch.*, October 31, 1911, p. 337) reports two cases in which vomiting, diarrhœa, tenesmus and collapse came on two hours after 0·4 grm. salvarsan was injected into the veins. Both recovered. An error in his technique is not excluded. His experience with the remedy is limited to about thirty cases. C. B.

Salvarsan in Eye Affections.—Dolganoff (*Berliner klin. Woch.*, November 6, 1911, p. 2019) treated 300 people, whose eyes were healthy, with salvarsan, and watched them for one or two months. No subjective or objective eye symptoms were observed. In four cases in which the changes in the fundi were suggestive of incipient neuritis or atrophy, no alteration for the better or for the worse was noted after "606." Of seven patients with optic atrophy, there was improvement under salvarsan

in one, checking of the process in four, and downward progress in two. He thinks that his results are in favour of the remedy, and he mentions several other observers who are of the some opinion. Stulp who has analysed all published reports, found that salvarsan benefited 25 per cent of cases of optic atrophy and did harm to none. On the other hand, there are observers who have not been so favourably impressed. Improvement of vision was found in two instances of double optic neuritis, but in five others no change occurred. Several authors have had good results with "606" in this condition. Relapses, however, have been not uncommon. Neuhaus asserts that salvarsan exerts no evil influence on the optic nerves, even when they are affected. Paralysis of the internal muscles of the eye was not modified by the treatment if it was of long standing (seven cases). Two out of three early cases recovered. In ophthalmoplegia externa the success of the remedy may be striking, more especially if the palsy is of recent origin, but it is not constant. Stulp's statistics show that 25 per cent of eye paralyses are ameliorated by salvarsan. Its effect is much more marked in iritis and cyclitis; 63 per cent of these cases are cured by it according to Stulp. Relapses are not rare. Turbidity of the vitreous is unchanged.

C. B.

Salvarsan in Interstitial Keratitis.—Wicherkiewicz (*Deutsch. med. Woch.*, November 2, 1911, p. 2055) finds that "606" does not retard the progress of interstitial keratitis.

C. B.

The Occurrence of Nerve Lesions in Syphilis.—V. Zeissl (*Berliner klin. Woch.*, November 3, 1911, p. 2017) has examined the reports of cases of syphilitic nerve disease to which reference has been made in Schmidt's Year Book from 1845 onwards, and in Proksch's Bibliography of Syphilis. He has scrutinized 167 histories. Oculo-motor and facial palsies, sudden blindness, deafness, tinnitus, retinitis, choroiditis, optic neuritis, are all recorded as occurring a few months after infection. Hemiplegia also may be a condition which arises within the first six months. Extra-genital syphilis complicated with herpes zoster appears to predispose to nerve sequelæ. Since these happened in pre-salvarsan days, he thinks that nerve symptoms which are sometimes noted after injections of this remedy are not caused by it. He himself has observed no nerve lesion after salvarsan, though he has employed it 279 times.

C. B.

Scharlach Rot. for Healing of Wounds.—Schmiedens (*Münch. med. Woch.*, October 10, 1911, p. 2495) had observed that the subcutaneous injection of the dye scharlach rot., which is used by histologists to stain fat, into the ear of a rabbit causes the appearance of epithelial tumours. He therefore tried the effect of it on large granulating surfaces. He found that extensive burns healed rapidly under vaseline containing 5 per cent of this substance. Holinger stated that he had employed it since 1908 in mastoid operations and had noted expeditious healing. Vaughan and Beck both speak well of its cicatrizing properties, especially in foul wounds.

C. B.

Secondary Syphilis in Rabbits.—Sowade (*Deutsch. med. Woch.*, October 19, 1911, p. 1935) has induced constitutional syphilis in rabbits by means of intravascular injections of cultures of the *Treponema pallidum.* Loss of hair and weight, papular and ulcerating skin lesions, paronychia, iritis and enlarged glands and a positive Wassermann reaction have been observed by him. C. B.

Double Cyanide of Potassium and Silver in the Treatment of Gonorrhœa.—Philippson (*Münch. med. Woch.*, February 28, 1911).—This salt contains 54·2 per cent of silver, and the author claims that it is as efficient as silver nitrate, while it is much less irritating to the mucous membrane, and does not stain the patient's linen. He uses it in the following way: A stock solution is prepared in a drop bottle by dissolving 6 grm. of the salt in 30 c.c. of distilled water. From 4 to 80 drops of the stock solution are added to 200 c.c. of warm tap water for irrigating the urethra. Chronic cases are stated to clear up rapidly under the influence of this drug, provided the solutions used are not too strong.

C. E. P.

Sterilization of Drinking Water.—Stabsarzt Weissenstein (*Militärarzt*, No. 4, 1911) describes a proposed form of portable stove, made to embrace the man's mess tin. The stove is fitted for burning spirit, but coal, wood or oil may be used. The author claims that it could be used while on the march. He calculates that using this apparatus half a litre (17·5 oz.) of water could be boiled in ten minutes and could then be made into tea or allowed to cool. The stove would also enable each man to do his own cooking. The quantity of spirit required to boil half a litre of water is 20 c.c. Assuming that the man would require to boil 2 litres of water daily for drinking, this would use 80 c.c. of spirit; allow-60 c.c. for cooking and 10 c.c. for waste, the total required would be 150 c.c. daily per head, or 37·5 litres per company or 150 litres per battalion. This would mean an extra half wagon load of supplies for each battalion. To compensate for this extra weight the present cooking pots could be done away with and the wine ration discontinued. The apparatus weighs 420 grm. (15 oz.) which with two days supply of spirit carried in an aluminium bottle would increase the man's load by 820 grm. (1 lb. 13½ oz.). C. E. P.

French Recruiting Statistics for 1909.—*The Internationale Revue über Armeen und Flotten*, November, 1911, gives an extract of the recruiting statistics in France for the army year beginning October 1, 1909.

The total number liable for service was 316,200. These were disposed of as follows:—

Taken for service with the active army	218,315
For administrative services	11,333
As volunteers	24,911
Excluded from service on moral grounds	53
Put back till the next year	33,981
Postponed	3,485
Physically unfit	25,692

The rejections on medical grounds were equal to 8·12 per cent of the whole contingent and included the following :—

Poor physique, 4,500 ; tubercle of lung, 3,000 ; other forms of tubercle, 1,200 ; eye diseases, 1,700 ; mental deficiency, 1,137.

Among the men taken for administrative services were : 2,264 with disease of the eyes ; 737 myopes ; 512 with deformity of the spine ; 446 with deformities of the feet ; and 470 hump backs.

Among the enlisted were also 4,004 foreigners, of whom only 276 were naturalized Frenchmen. C. E. P.

The Red Cross Society of Japan.—(Extract from the *Red Cross in Far East, Bull.* 3, May, 1910) :—

"*Reorganization of Voluntary Aid Detachments for War.*

"As the result of experience gained in the recent war, a Central Relief Department has been formed as under :—

"*The Central Relief Department.*

The Executive Chief : Manager-General		1
Relief Bureau	Chief : Chief manager or assistant chief manager	1
	Officers : Managers and assistant managers	Indefinite.
	Clerks	,,
Treasury Bureau	Chief : Chief manager or assistant chief manager	1
	Officers : Managers and assistant managers	Indefinite.
	Clerks	,,

"*Branch Relief Department.*

The Executive Head : Chief manager or assistant chief manager	1
Officers : Manager or assistant manager	1
Clerks	Indefinite.

"*Relief Agency Office Central or Branch.*

The Executive Head : Manager	1
Clerks	Indefinite.

"*Hospital Trains.*

"Personnel for hospital trains has been fixed at : one chief medical officer, two medical officers, one assistant manager, one pharmaceutist, one clerk, two chief nurses, and twenty nurses (among whom four group-chiefs), that is, twenty-eight persons in all.

"The arrangement and fitting of hospital trains has not as yet been ettled.

"*Hospital Ships.*

"It has been found that a ship of 5,000 tons is the most convenient size ; two such ships are being constructed.

"Personnel.

	New system	Old system
Manager	None	1
Chief medical officer	1	1
Medical officers	5	3
Pharmaceutist	1	1
Assistant manager	1	none
Clerks	2	2
Assistant pharmaceutist	1	1
Chief nurses	1	2
Nurses (among whom 10 group-chiefs)	50	20
Chief attendants	None	2
Attendants	1	20
	63 persons	53 persons.

"Formerly we employed both nurses and attendants, but, as experience has taught us the inadvisability of this mixed system, we will henceforth employ nurses only, and, for heavy work, ten or fifteen labourers as required will be engaged. The one attendant listed in the above table is employed in the capacity of a mechanic.

"Relief Detachments.

"The organization of these has been altered to the following:—

Medical officers	1	(detatchment chief).
Pharmaceutist	1	
Clerks	1	
Chief nurse (or attendants)	2	
Nurses (or attendants)	20	(of whom 10 are group-chiefs).
	25 persons.	

"Transport Columns.

"The new regulations have reduced the number into about a half of the former by dividing one column into the central, and five detachments of stretcher-bearers. The reason for this is to enable the transport column to divide itself whenever the circumstances require it for the evacuation of patients. Its formation is then as follows:—

"The Central.

1 Manager (who is chief of the column).
1 Chief stretcher-bearer.
1 Stretcher-bearer, and 5 detachments, each composed as follows :—
1 Chief stretcher-bearer.
Group 1 : 4 stretcher-bearers (of whom 1 is chief)
Group 2 : 4 ,, ,, (1 chief).
Group 3 : 4 ,, ,, (1 chief).

"The above is the standard formation of the relief corps of the Society in case of future emergency.

"Lastly, in consequence of these amendments in the regulations for relief service in time of war, we have now more extensive preparations for relief than before. That is to say, while formerly there were ninety-seven organizations with nurses, and eighteen with attendants as the regular number of the personnel required for relief preparation, now we shall have in their places 124 of the former, and thirty-nine of the latter. Further, against three preparatory transport columns for relief service

according to the old system, we are going to have now six of them. As to the reconstruction of hospital ships, we have already referred to it above.

"In a word, the expansion of the system of relief preparations has resulted in the increase of twenty-nine relief organizations with nurses, twenty-four organizations with attendants, and of six transport columns for the evacuation of patients; whereas the regular number of the personnel is 580 nurses, 480 attendants, and 360 stretcher-bearers, besides the provision of reserve members as many as two-fifths of regulars. The number of the relief corps ready for an instant mobilization as provided for by the Society at the end of 1908 is: two hospital ships, eighty-nine relief organizations with nurses, fifteen organizations with attendants; while the number of persons to be engaged in them is 221 medical officers, 91 pharmaceutists, 48 clerks, 2 assistant pharmaceutists, 263 chief nurses, 61 chief attendants, 3 chief stretcher-bearers, 2,534 nurses, 575 attendants, 130 stretcher-bearers, and 117 nurses, still in preparatory courses. It is our plan to complete the organization of the different relief corps and their personnel as required in the new regulations by the end of 1914."

Correspondence.

MACHETE FOR THE ROYAL ARMY MEDICAL CORPS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—On page 170, line 39, Royal Army Medical Corps Training, 1911, the following sentence occurs: "The tools required are a yard-measure, a tenon-saw or billhook, and a jack-knife." These are the tools required to adapt a Scotch haycart to the transport of wounded. It all looks beautifully simple and easy on paper when one imagines the yard-measure, &c., ready to hand. In actual practice one would more easily find the haycart than the tools, and the probability is that one would have to adapt the article with the aid of a jack-knife only. Any member of the Medical Service is supposed to be able to make stretchers, shelters for wounded, and many other things requiring cutting of wood, and the only tool he has to do it with is a clasp knife. When the Lancaster sword-bayonet was taken from the rank and file one thought that it was to be replaced by something useful, e.g., machete or kookri. Of the latter weapon I know nothing, but with the former a raw West Coast native will do most things. Most officers of the Corps find their way to the West Coast or West Indies these days, so no description of the weapon is needed; it is sufficient to say that the weapon is light, handy and not easily damaged; it can be easily sharpened on any stone, and easily cleaned. It is carried on the soldier in the same manner as

the bayonet, but lies flatter and more comfortably. To obtain a yard-measure with it it is only necessary to mark out the back of the blade and handle into inches. The weapon seems to be peculiarly adapted to the needs of those whose work lies in field ambulances and clearing hospitals. Armed with the machete the rank and file of the Royal Army Medical Corps would have their yard-measure, &c., ready to hand, and one would hear less of "Where the —— is that —— chopper."

I have the honour to be, Sir,

Your obedient servant,

Fleetwood,
January, 16, 1912.

F. W. COTTON,
Capt. R.A.M.C.

No. 4. April, 1912. Vol. XVIII.

J. T. Fotheringham
Lt. Col.

Journal
OF THE
Royal Army Medical Corps

EDITED BY
COLONEL W. H. HORROCKS,
ROYAL ARMY MEDICAL CORPS

ASSISTED BY
MAJOR C. E. POLLOCK
ROYAL ARMY MEDICAL CORPS

ISSUED MONTHLY

IN ARDUIS FIDELIS

Printed and Published by
JOHN BALE, SONS & DANIELSSON, Ltd.
OXFORD HOUSE,
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOLUME XVIII. APRIL, 1912. No. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

EXPERIMENTS TO ASCERTAIN IF ANTELOPE MAY ACT AS A RESERVOIR OF THE VIRUS OF SLEEPING SICKNESS (*TRYPANOSOMA GAMBIENSE*).[1]

BY COLONEL SIR DAVID BRUCE, C.B., F.R.S., AND CAPTAINS A. E. HAMERTON, D.S.O., AND H. R. BATEMAN, R.A.M.C.

INTRODUCTION.

THE question of a reservoir of the virus of sleeping sickness, other than man and his domestic animals, is of the utmost importance.

Now man and the domestic animals have been removed from the Lake-shore of the mainland for some two and a half years, and from the islands since September, 1909. The effect of this depopulation has been to make a two mile area along the northern shores of the Lake virtually a game reserve, in which water-buck, bush-buck, reed-buck, Speke's *Tragelaphus*, hippopotami, wild pig, and other large game abound. The game water freely at the Lake-shore, and small herds of antelope may frequently be seen grazing on the grassy hillsides overlooking the Lake.

Notwithstanding the removal of man and his domestic animals, the Lake-shore *Glossina palpalis* continued to infect susceptible animals with sleeping sickness up to the end of March, 1910. The Commission, therefore, endeavoured to find answers to the following questions :—

[1] Reprinted from the *Proceedings of the Royal Society*, B, vol. 83.

(1) Can antelope be infected with sleeping sickness by the bites of laboratory-bred and laboratory-infected *G. palpalis?*

(2) If antelope can be infected with the virus of sleeping sickness, can they transmit the infection to laboratory-bred *G. palpalis* when these flies are allowed to feed upon them? Further, if these *G. palpalis* become infected, can they transmit the virus to susceptible animals?

(3) If these *G. palpalis* become infected with the virus of sleeping sickness, what percentage are so infected?

(4) How does sleeping sickness affect the health of the antelope?

(5) Lastly, are antelope living in the fly-area naturally infected with sleeping sickness?

Should all these questions be answered in the affirmative, the importance of the observation is patent. The continued infectivity of the flies on the Lake-shore would be explained. Whilst the movements of man and the domestic animals can, to some extent, be controlled by administrative measures, the movements of antelope in search of new grazing grounds would be almost impossible to check, owing to the difficult nature of the forested and elephant-grass country which in so many parts borders the Uganda shores of the Lake. Game laws would require modification, and the destruction of the game in the neighbourhood of the lakes and *palpalis*-frequented rivers would become a factor in the control of sleeping sickness.

To answer the above queries the following experiments were devised and carried out:—

(1) *Can Antelope be Infected with Sleeping Sickness by the Bites of Laboratory-bred and Laboratory-infected* Glossina palpalis?

Eleven buck in all were employed in this experiment. Four bush-buck (*Tragelaphus sylvatica?*), six reed-buck, (*Cervicapra arundinacea*), and one water-buck (*Cobus defassa*). Other buck, such as "oribi" (*Cephalophus grimmi*) and "entalaganya" (*C. equatorialis*), were obtained by the Commission, but did not survive long in captivity.

As each buck arrived its blood was usually injected, subcutaneously, into monkeys or rats, to ascertain if the blood was naturally infected with trypanosomes. The method then adopted in each case to infect the antelope with sleeping sickness was as follows: A cage of clean[1] laboratory-bred *G. palpalis* was fed on

[1] The word "clean," applied here and throughout this paper to laboratory-bred *G. palpalis*, means flies which have newly hatched out from pupæ in the laboratory and have never fed.

a monkey known to be infected with a *human strain* of *Trypanosoma gambiense.* This cage of artificially-infected flies was then fed on healthy animals until one of the animals (monkeys) became infected with sleeping sickness. Having proved that the flies were infective, the cage of flies was then fed, about five minutes daily, for several days, on one or other of the buck. The buck's blood was then examined daily for trypanosomes, and was further tested for sleeping sickness by its inoculation into monkeys or rats.

The experiments follow in full detail.

Experiment 2328. Bush-buck.

This bush-buck was fed on for five days (March 24, 25, 26, 28, and 29, 1910) by laboratory-bred *G. palpalis* which were known to be infected with a *human strain* of *T. gambiense.*

On April 8, fifteen days after the first feed of the infected flies on this buck, 5 c.c. of the buck's blood were injected, subcutaneously, into a healthy monkey.

April 19, monkey showed *T. gambiense* in its blood. The trypanosomes were verified by examination in fresh and stained preparations of the blood.

Result.—Positive.

Remarks.—The preliminary inoculation of the blood into susceptible animals, to ascertain if the buck's blood naturally harboured trypanosomes, was not made in this case. Though examined almost daily from March 29 to August 5, 1910, *T. gambiense* was never seen in the blood of this antelope. Fresh and stained blood films were made and examined. On one occasion only—April 20—*T. ingens* was seen in a fresh preparation. Monkeys are not inoculable with this parasite.

Experiment 2357. Reed-buck.

April 8, 1910, 5 c.c. of this buck's blood were injected, subcutaneously, into a normal monkey, to ascertain if buck's blood naturally harboured trypanosomes. This monkey's blood was examined bi-weekly for a month. Monkey remained healthy, no trypanosomes appearing in its blood.

Buck was fed on for twelve days, between April 7 and 20, 1910, by laboratory-bred *G. palpalis* known to be infected with a *human strain of T. gambiense.* On the thirteenth day after the first feed of these flies, 3 c.c. of the buck's blood were inoculated into

a normal monkey. Examined bi-weekly for a month this monkey remained healthy.

T. gambiense having appeared in the buck's blood on May 2, a further inoculation of 5 c.c. of its blood was made into a normal monkey on this date. This monkey showed *T. gambiense* in its blood on May 10.

Result.—Positive.

Remarks.—This reed-buck was evidently free from any trypanosome infection inoculable into monkeys on its arrival at the laboratory. *T. gambiense* appeared for the first time in the buck's blood in scanty numbers on May 2, 1910, twenty-five days after the first feed of the supposed infective *G. palpalis.* On May 3 and 4, the trypanosomes were fairly numerous in the blood, and on the 5th and 6th, scanty numbers only were seen. After May 6, *T. gambiense* was never again seen in the blood, though examined for almost daily up to August 5, 1910. The long period of twenty-five days which elapsed between the first feed of the supposed infected Glossina and the appearance of the trypanosomes in the buck's blood may be accounted for by the supposition that the infected fly or flies in the cage which was fed on the buck from April 7 to April 19 had died before they had fed on the buck. On April 20, a fresh cage of *G. palpalis,* known to be infected with a *human strain* of *T. gambiense* was fed once only, on this buck, and on the twelfth day after this feed, on May 2, trypanosomes appeared in the buck's blood. This supposition is probably correct, and further accounts for the failure of the inoculation of April 20.

Experiment 2359. Reed-buck.

On April 8, 1910, 5 c.c. of this buck's blood were injected, subcutaneously, into a normal monkey, to ascertain if buck's blood naturally harboured trypanosomes. This monkey's blood was examined bi-weekly for a month. Monkey remained healthy.

Buck was fed on for six days (April 25 to 30, inclusive) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense.*

On May 6, the eleventh day after flies' first feed, *T. gambiense* appeared in buck's blood in fair numbers, and 5 mm. were injected, subcutaneously, into normal white rat. On May 11 this rat showed *T. gambiense* in its blood.

Result.—Positive.

Remarks. — This reed-buck was evidently free from any trypanosome infection inoculable into monkeys on its arrival at

the laboratory. *T. gambiense* appeared for the first time in its blood in fair numbers on May 6, 1910, again on 7th, not examined for on 8th, scanty on 9th, absent on 10th, scanty on 11th, very numerous on 12th, and never seen again, though examined for almost daily till August 5.

Experiment 2371. Bush-buck.

On April 13, 1910, 5 c.c. of this buck's blood were injected, subcutaneously, into a normal monkey, to ascertain if buck's blood naturally harboured trypanosomes. This monkey's blood was examined bi-weekly for a month. Monkey remained healthy.

Buck was fed on for eight days (April 22 and 23, and from April 25 to 30, 1910, inclusive) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense.*

On May 4, the twelfth day after the infected flies' first feed on the buck, *T. gambiense* appeared in the buck's blood in fair numbers.

On May 5, trypanosomes were numerous, and 2 c.c. of the buck's blood were injected, subcutaneously, into a normal monkey. On May 13 this monkey showed *T. gambiense* in its blood.

Result.—Positive.

Remarks.—Buck was free from trypanosomes inoculable into a monkey on its arrival at the laboratory. *T. gambiense* appeared in buck's blood for the first time, in scanty numbers, on May 3, 1910, and again in fair numbers on May 4; thereafter no trypanosomes were seen up to August 5, 1910, though the blood was almost daily examined.

Experiment 2378. Water-buck.

On April 13, 1910, 5 c.c. of this buck's blood were injected, subcutaneously, into a normal monkey, to ascertain if the buck naturally harboured trypanosomes in its blood. This monkey was examined bi-weekly for one month; monkey remained healthy.

Buck was fed on for eight days (April 22, 23, 25 to 30, inclusive) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense*. *T. gambiense* was never seen in this buck's blood, though examined for almost daily from April 22 to August 5, 1910.

On May 5, 5 c.c. of the buck's blood were injected, subcutaneously, into a normal monkey, an interval of thirteen days having elapsed since first feed of the infected flies. This monkey showed *T. gambiense* in its blood on May 13, 1910.

Result.—Positive.

Remarks.—Buck was free from trypanosomes inoculable into a monkey on its arrival at the laboratory. Though *T. gambiense* never appeared in the buck's blood, yet a positive result was obtained on its inoculation into a monkey, and, as will be seen below (Table II), clean laboratory-fed flies fed on this buck for several days became infected with *T. gambiense*.

Experiment 2427. Reed-buck.

On May 4, 1910, 1 c.c. of this buck's blood was injected, subcutaneously, into a normal white rat. This rat, examined biweekly for one month, remained healthy.

Buck was fed on for six days (May 2 to 7, inclusive) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense*.

On May 9, the seventh day after infected flies' first feed on the buck, *T. gambiense* appeared in scanty numbers in its blood for the first time. One cubic centimetre of the blood was then injected, subcutaneously, into a normal white rat. On May 16, *T. gambiense* appeared in this rat's blood.

Result.—Positive.

Remarks.—On its arrival at the laboratory the buck was free from trypanosomes inoculable into a rat. A few *T. gambiense* appeared for the first time on May 9, 1910, in buck's blood; they were present in fair numbers on the 10th, scanty again on the 11th, and were seen for the last time, in fair numbers, on May 12. Almost daily blood examinations were made, with negative results, up to August 5, 1910.

Experiment 2428. Bush-buck.

On May 4, 1910, 1 c.c. of this buck's blood was injected, subcutaneously, into a normal white rat. This rat remained healthy, its blood being examined for one month after the injection.

Buck was fed on for thirteen days (May 2 to 16), inclusive, May 9 and 15 being excepted) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense*. *T. gambiense* was never seen in this animal's blood, though examined for almost daily from May 4 to August 5, 1910.

On May 16, fourteen days after infected flies' first feed on the buck, a few drops of the buck's blood were injected, subcutaneously, into a normal white rat. This rat showed *T. gambiense* in its blood on May 23. No trypanosomes were ever seen in buck's blood.

Result.—Positive.

Remarks.—On its arrival at the laboratory the buck was free from trypanosomes inoculable into a rat. No trypanosomes were ever seen in the buck's blood, nevertheless its blood was infective on inoculation, and, as will be seen later (Table II), capable of infecting clean laboratory-bred *G. palpalis.*

Experiment 2429. Reed-buck.

On April 13, 1910, 5 c.c. of this buck's blood were injected, subcutaneously, into a normal monkey. This monkey remained healthy, its blood being examined bi-weekly for a month after the injection. On May 3, 1910, 1 c.c. of the buck's blood was injected, subcutaneously, into a normal rat. This rat remained healthy, its blood also being examined bi-weekly for a month after the injection.

The buck was fed on for eight days (May 2 to 7, and 9 and 10, inclusive) by *G. palpalis* known to be infected with a *human strain* of *T. gambiense.*

On May 11, the ninth day after the infected flies' first feed on the buck, *T. gambiense* appeared in scanty numbers in its blood for the first time. On May 13, the trypanosomes being numerous in the blood of the buck, a few drops of the blood were injected, subcutaneously, into a normal white rat. This rat showed *T. gambiense* in its blood on May 17.

On July 2, 1910, this buck accidentally broke its leg and had to be killed, 4 c.c. of its heart's blood being injected into a normal monkey. This monkey showed *T. gambiense* in its blood on July 12.

Result.—Positive.

Remarks.—On its arrival at the laboratory the buck was free from trypanosomes inoculable into monkeys or rats. *T. gambiense* appeared in its blood for three days—on May 11 for the first time in scanty numbers, on May 12, many, and on May 13, very many—thereafter no trypanosomes were seen, though almost daily examinations were made up to July 2, 1910. It will be noted that the buck's blood was still infected with *T. gambiense* on July 2—that is, fifty days after the last date (May 13) that trypanosomes were seen in it.

Experiment 2431. Reed-buck.

On May 3, 1910, 1 c.c. of this buck's blood was injected, subcutaneously, into a normal white rat. Rat remained healthy, its blood being examined bi-weekly for a month after the injection.

The buck was fed on for six days (May 2 to 7, inclusive) by laboratory-bred *G. palpalis* known to be infected with a ***human strain*** of *T. gambiense*.

On May 12, 1910, the tenth day after the infected flies' first feed, *T. gambiense*, in scanty numbers, appeared for the first time in the blood of the buck. On May 13, the trypanosomes being numerous in the blood of the buck, a few drops of its blood were injected, subcutaneously, into a normal white rat. This rat showed numerous *T. gambiense* in its blood on May 20.

Result.—Positive.

Remarks.—On its arrival at the laboratory the buck was free from trypanosomes inoculable into rats. *T. gambiense* appeared in the buck's blood, in scanty numbers, for the first time on May 12, and were present in large numbers on May 13 and 14.

We have now to record one of the most important and suggestive observations in this series of experiments. *From May 14 to June 27 the blood was examined almost daily, and on the latter date —June 27—forty-four days after trypanosomes were last seen,* T. gambiense *reappeared for one day in this buck's blood in fair numbers.* Their identity was established by careful examination in wet and stained preparations of the blood.

N.B.—Two mechanical transmission experiments were carried out with this buck. In the first, fifty flies were used and were fed on the buck for the three days the trypanosomes were seen in its blood. *Result.*—Negative. In the second, 100 flies were used, and were fed for four days on the buck. No trypanosomes were seen in the buck's blood during these days. *Result.*—Negative. In the first experiment four hours, and in the second one hour, elapsed between the feed on the buck and the feed on the healthy monkey.)

Experiment 2445. Reed-buck.

No preliminary inoculation of this buck's blood was made on its arrival at the laboratory.

The buck was fed on for seven days (May 6 and 7, and 9 to 13, inclusive) by laboratory-bred *G. palpalis* known to be infected with a *human strain* of *T. gambiense*.

On May 14, 1910, the eighth day after the infected flies' first feed, *T. gambiense* appeared in the blood of the buck for the first time. On May 20 the buck died, and a small quantity of its heart's blood was injected, subcutaneously, into a normal white rat. On June 2, rat showed *T. gambiense* in its blood. (This rat was over-

looked from May 24 to June 2, and its blood was not examined between these dates.)

Result.—Positive.

Remarks.—The blood of this buck was (with the exception of May 8) examined daily from May 6 to 13 with negative results for trypanosomes. On May 14, *T. gambiense* appeared for the first time in its blood in scanty numbers; on the 16th, 17th, and 18th they were very numerous; on the 19th they were again scanty, and on the day of death, May 20, 1910, no trypanosomes could be found, the peripheral and heart's blood being examined.

Table I gives results of feeding infected *G. palpalis* on healthy antelope.

TABLE I.

Number of experiment	Species of antelope	Number of days infected flies fed	Number of days before trypanosomes appeared	Result		Remarks
				Positive	Negative	
2328	Bush-buck ..	5	*—	+	..	Trypanosomes never seen
2357	Reed-buck ..	12	25	+	..	..
2359	,, ..	6	11	+	..	..
2371	Bush-buck ..	8	12	+	..	..
2372	,, ..	6	8	+	..	..
2378	Water-buck..	8	—	+	..	Trypanosomes never seen
2427	Reed-buck ..	6	7	+	..	..
2428	Bush-buck ..	13	—	+	..	Trypanosomes never seen
2429	Reed-buck ..	8	9	+	..	..
2431	,, ..	6	10	+	..	..
2445	,, ..	7	8	+	..	..

From these experiments it is shown that antelope may be readily infected with sleeping sickness by the bites of artificially-infected tsetse flies. Eleven antelope were used, and in every case a positive result was obtained. It will be remembered that in similar experiments made with cattle the same result was obtained.

(2) *If Antelope can be infected with the Virus of Sleeping Sickness, can they transmit the Infection to clean laboratory-bred* Glossina palpalis *when these Tsetse Flies are allowed to Feed upon them? Further, if these* G. palpalis *become infected, can they transmit the Virus to Susceptible Animals?*

It has now been proved that water-buck, reed-buck, and bush-buck can be infected with the virus of sleeping sickness with what would seem to be unfailing regularity. Should, however, these antelope be incapable of infecting the *G. palpalis*

with *T. gambiense*, the fact is of academic importance only. On the other hand, should the results of feeding clean laboratory-bred *G. palpalis* on these infected buck give positive results when these flies are subsequently fed on normal susceptible animals, a further step has been made in the search for a reservoir of the virus of sleeping sickness, other than man and his domestic animals.

The method adopted to test this second query was carried out as follows: Clean, laboratory-bred *G. palpalis* were fed for several days on an infected buck. After an interval of starvation of twenty-four hours or more the flies were transferred to healthy animals and fed daily. When the healthy animal showed *T. gambiense* in its blood the experiment was stopped, and the surviving flies were dissected as soon as possible.

The result of twenty-four experiments carried out on these lines is given in the following table:—

On glancing at Table II it will be seen that twenty-four experiments in all were carried out. Of these, seventeen were positive (70·84 per cent), and seven negative (29·16 per cent). The shortest time which elapsed before the flies became infective was twenty-four days, the longest forty-nine days, and the average 33·35 days. Compare these results with those detailed in the *Proceedings of the Royal Society*, B, 1910, vol. lxxxii, p. 374, Table III. Of the forty-two experiments there described, only eight (19 per cent) were positive. The clean laboratory-bred flies were fed on *T. gambiense*-infected monkeys in thirty-six of those experiments, in one case on a sleeping sickness patient, and in five cases on oxen infected with the virus of sleeping sickness.

Positive results were obtained from all the buck on at least one occasion, with the exception of bush-buck, Experiment 2372, and reed-buck, Experiment 2445. Only two experiments were carried out from these buck, one from each—viz., Experiments 2499 and 2476. In Experiment 2499 the flies were fed on the antelope nineteen days after the trypanosomes had disappeared from its blood, as far as microscopical examination went. In Experiment 2476 the flies were non-infective to monkeys up to the forty-fifth day after their first feed on the infected buck. This latter experiment was proceeding when the Commission left Uganda, and a positive result may yet have to be recorded.

The most significant of the above observations is the one in which it is shown that fifty-five days after the last feed of infected *G. palpalis* on bush-buck, Experiment 2328, the blood of this

buck was capable of infecting clean laboratory-bred flies, though *T. gambiense* had never been seen in its blood.

TABLE II.—GIVING THE RESULT OF FEEDING LABORATORY-BRED FLIES ON ANTELOPE INFECTED WITH SLEEPING SICKNESS.

Number of experiment	Number of clean flies used	Species of antelope flies fed on	Number of days flies fed on antelope	Number of days before flies became infective	Result		Remarks
					Positive	Negative	
2346	160	Bush-buck 2328	12	29	+	..	Buck 2328 never showed *T. gambiense* in blood. In spite of this, flies fed on it became infected 55 days after the buck's infection
2384	100	,,	8	28	+	..	
2414	70	,,	6	29	+	...	
2501	100	,,	8	39	+	..	
2351	100	Reed-buck 2357	7	41	+	..	Buck 2357 showed *T. gambiense* in its blood for 5 days only
2500	100	,,	8	—	..	—	
2510	100	,,	5	—	..	—	
2507	200	Reed-buck 2359	6	44	+	..	Buck 2359 showed *T. gambiense* in its blood for 7 days only
2421	50	Bush-buck 2371	6	—	..	—	Buck 2372 showed *T. gambiense* in its blood for 3 days only
2477	60	,,	6	29	+	..	
2499	100	Bush-buck 2372	8	—	..	—	Buck 2371 showed *T. gambiense* in its blood for 2 days only
2451	95	Water-buck 2378	6	30	+	..	Buck 2378 never showed *T. gambiense* in its blood.
2478	60	,,	6	—	..	—	
2559	50	,,	4	—	..	—	
2454	110	Reed-buck 2427	6	24	+	..	Buck 2427 showed *T. gambiense* in its blood for 4 days only
2456	60	,,	4	33	+	..	
2508	100	,,	6	30	+	..	
2485	50	Bush-buck 2428	7	28	+	..	Buck 2428 never showed *T. gambiense* in its blood
2460	50	Reed-buck 2429	4	27	+	..	Buck 2429 showed *T. gambiense* in its blood for 3 days only
2543	100	,,	6	49	+	..	
2464	55	Reed-buck 2431	3	28	+	..	Buck 2431 showed *T. gambiense* in its blood for 4 days only. In spite of this, flies fed on it became infected 81 days after its infection
2544	90	,,	6	36	+	..	
2592	100	,,	5	43	+	..	
2476	50	Reed-buck 2445	4	—	—	—	Buck 2445 showed *T. gambiense* in its blood for 6 days only

To illustrate how these experiments were carried out, full details of two are given. They are typical of the methods adopted. One positive and one negative experiment have been chosen (see next page).

These experiments show that antelope of the water-buck, reed-buck, and bush-buck species, when infected with the virus of sleeping sickness, can transmit the infection to clean laboratory-bred *G. palpalis*. The infected antelope's blood was, in one case,

infective to *G. palpalis* for at least eighty-one days, and in another for at least fifty-five days. These experiments further show that the flies, when infected by the virus of sleeping sickness obtained from the blood of the antelope, are capable of transmitting the virus to susceptible animals.

Experiment 2501.—To ascertain if laboratory-bred *G. palpalis* become infective when fed on antelope whose blood contains *T. gambiense.*

Date	Day of experiment	Procedure	Result	Remarks
1910. May 23—28 ..	1—5	Flies fed 5 minutes daily on Bush-buck 2328		100 flies used.
,, 29	6	Flies starved		
,, 30—31 ..	7—8	Flies again fed 5 minutes daily on Buck 2328		
June 1	9	Flies starved		
,, 2—July 7	10—45	Flies fed 5 minutes daily on normal Monkey 2517		July 8, Monkey 2517 shows *T. gambiense* in its blood to day. Allowing 7 days for incubation of *T. gambiense* in Monkey's blood, then the *G. palpalis* became infective on the 39th day after their first infected feed on Buck 2328.
July 8	46	Flies starved, as Monkey 2517 shows *T. gambiense* in its blood	+	
,, 9	47	The 57 surviving *G. palpalis* dissected; 20·3 per cent of these flies showed heavy intestinal infection with flagellates (*T. gambiense*)		

Remarks.—This is the experiment referred to above, where the blood of a buck was capable of infecting clean laboratory-bred flies 55 days after last feed of infected flies on the buck.

Experiment 2499.—To ascertain if laboratory-bred *G. palpalis* become infective when fed on antelope whose blood contains *T. gambiense.*

Date	Day of experiment	Procedure	Result	Remarks
1910. May 23—28 ..	1—5	Flies fed 5 minutes daily on Bush-buck 2372		100 flies used.
,, 29	6	Flies starved		
,, 30—31 ..	7—8	Flies again fed 5 minutes daily on Buck 2372		
June 1	9	Flies starved		Monkey 2552 was examined bi-weekly from June 13 to August 12. It remained healthy. The surviving *G. palpalis* were not dissected as experiment was negative.
,, 2—11 ..	10—19	Flies fed on Cock 2518		
,, 12	20	Flies starved		
,, 13—July 12	21—50	Flies fed 5 minutes daily on clean Monkey 2552	–	
July 13 and following days	51	Flies allowed to die. Not dissected as experiment negative		

(3) *If* Glossina palpalis *can be infected with the Virus of Sleeping Sickness by feeding on the Blood of* Trypanosoma gambiense-*infected Antelope, what percentage are found to be so infected?*

It has been shown now that the antelope can be infected with the virus of sleeping sickness, that when so infected they can infect the fly, and the fly in its turn can convey the disease to susceptible animals.

These facts form a serious sequence of events, which constitute a danger not formerly appreciated in the administrative measures adopted to check the spread of the disease. What is the extent of the danger? A part of this large and important query can be answered if one can give an idea of the percentage of *G. palpalis* that became infected with the virus of sleeping sickness after they have fed on the infected antelope.

Throughout all these experiments only clean laboratory-bred flies were employed. The fact that there is no hereditary transmission of trypanosomes in *G. palpalis* is considered to have been so conclusively proved that two of the members of the Commission have allowed several hundreds of clean laboratory-bred flies to bite them. Further, no evidence has ever been obtained by the Commission that these flies became infected with any flagellate by contact with other flies or fouled cages. Thus, any flagellates found in the laboratory-bred *G. palpalis* in these experiments must be considered to be derived from the infected antelope.

In some of the experiments the flies were fed, for varying periods, upon fowls. As will be shown in a further paper, the Commission found an avian trypanosome in some of the fowls obtained for experimental purposes. It would, therefore, be a fair criticism to state that a percentage of the flagellates found on dissection of the Glossina were avian in origin, were it not for the fact that negative experiments went to prove that this fowl trypanosome did not develop in the Glossina. It is also true that on one occasion the Commission thought they had succeeded in infecting a fowl with *T. gambiense*; it may, therefore, be argued that the fowls fed upon in some of these experiments were naturally infected with *T. gambiense*, and that the Glossina obtained their infection from such naturally-infected fowls and not from the antelope. Though many experiments were devised and carried out to try and confirm this one positive result, all efforts to infect fowls with sleeping sickness were so uniformly negative that the Commission must consider the one "positive" result to be an error.

TABLE III.—Giving the Percentage of Flies which became infected when Fed on infected Antelope. Flies Fed at first on the infected Antelope and afterwards only on Healthy Monkeys.

Number of experiment	Species of antelope flies fed on	Number of flies used	Number of flies dissected	Number of infected flies found	Percentage of infected flies	Remarks
2346	Bush-buck 2328	160	122	21	17·2	The gut-contents of 6 infected flies injected into a rat gave it sleeping sickness
2384	,, 2328	100	91	10	11·0	No injection of infected flies
2414	,, 2328	70	70	9	12·8	Five infected flies injected into a rat gave it sleeping sickness
2501	,, 2328	100	57	12	21·0	No injection of infected flies
2351	Reed-buck 2357	100	84	9	10·7	,, ,, ,,
2507	,, 2359	200	80	2	2·5	,, ,, ,,
2477	Bush-buck 2371	60	47	4	8·5	,, ,, ,,
2478	Water-buck 2378	60	—	—	—	Negative experiment. Flies not dissected
2559	,, 2378	60	—	—	—	,, ,, ,,
2454	Reed-buck 2427	100	92	13	14·2	One infected fly injected into a rat gave it sleeping sickness
2485	Bush-buck 2428	50	26	3	11·5	No injection of infected flies
2460	Reed-buck 2429	50	38	5	13·1	,, ,, ,,
2543	,, 2429	100	—	—	—	Negative experiment. Flies not dissected
2544	,, 2431	90	53	5	16·6	No injection of infected flies
2592	,, 2431	100	78	1	1·3	,, ,, ,,
2476	,, 2445	50	—	—	—	Negative experiment. Flies not dissected.

Remarks.—Of these sixteen experiments, twelve were positive and four negative. In the positive experiments, 838 flies were dissected. Of these, ninety-four showed heavy intestinal infection with developmental forms of *T. gambiense*, viz., 11·2 per cent. Of these infected flies, 43 were males and 51 females. If to these 838 flies be added all the *G. palpalis* of the negative experiments, we get a total of 1,108 flies, and a percentage of 8·5 infected. In only 3 of the positive experiments was an injection made into susceptible animals of the citrated gut-contents of the infected flies. All three gave positive results.

A reference to Table III will show that *G. palpalis* were infected by antelope blood where no fowls were ever fed on; in fact, it will be noticed that a higher percentage of negative results was obtained where fowls were introduced into the experiments. In some of the experiments the flies were dissected as they died throughout the whole experiment, and in others the flies were dissected only when the experiment became positive. If the experiment was a negative one the flies were not dissected. In order to avoid over-estimations

of the percentage of infected flies, no fly was called infected unless its gut was *swarming* with trypanosomes, and all the flies dissected during the earlier days of the experiments have been included. No fly was found to be infected with trypanosomes before the nineteenth day after its first infected feed on a buck. The tables otherwise explain themselves.

The methods of procedure adopted in the experiments detailed in the following table were precisely the same as those of Table III, with this one exception: The flies were, for varying periods, fed upon fowls as well as upon monkeys.

TABLE IV.—GIVING THE PERCENTAGE OF FLIES WHICH BECAME INFECTED WHEN FED ON INFECTED ANTELOPE. FLIES FED AT FIRST ON THE INFECTED ANTELOPE AND AFTERWARDS ON FOWLS, BEFORE BEING FED ON HEALTHY MONKEYS.

Number of experiment	Species of antelope flies fed on	Number of flies used	Number of flies dissected	Number of infected flies found	Percentage of infected flies	Remarks
2500	Reed-buck 2357	100	–	–	–	Negative experiment. Flies not dissected.
2510	,, 2357	100	–	–	–	,, ,,
2421	Bush-buck 2371	50	–	–	–	,, ,,
2499	,, 2372	100	–	–	–	,, ,,
2451	Water-buck 2378	95	93	2	2·1	No injection of infected flies.
2456	Reed-buck 2427	60	50	9	18·0	,, ,,
2508	,, 2427	100	68	6	8·8	Three infected flies injected into a rat gave it sleeping sickness.
2464	,, 2431	55	53	8	15·0	No injection of infected flies.

Remarks.—It will be seen that when the flies were fed on fowls and monkeys in these eight experiments, four were positive and four negative. In the positive experiment 264 flies survived for dissection; of these 25 showed heavy intestinal infection with developmental forms of *T. gambiense*, *i.e.* 9·47 per cent. Of the infected flies 11 were males and 14 females. If to these 264 flies be added all the *G. palpalis* of the four negative experiments, we get a total of 614 flies and a percentage of 4·0 infected. In the only experiment where an injection was made into a susceptible animal of the pooled citrated gut-contents of the infected flies, the result was positive.

An analysis of Tables III and IV brings out the following interesting points:—

In Experiment 2501, Table III, it is seen that 21 per cent of the *G. palpalis* were infected, out of the fifty-seven flies that survived for dissection on the forty-seventh day of the experiment. These flies were infected by bush-buck, Experiment 2328, which had never shown *T. gambiense* in its blood; and fifty-five days had elapsed since any infected Glossina had fed on this buck.

Sixteen out of the twenty-four experiments were positive. If

all the *G. palpalis* dissected in these positive experiments be grouped together, it is seen that a total of 1,102 flies were examined. Of these, 119 flies—fifty-four male and sixty-five female—were infected with developmental forms of *T. gambiense*—that is, 10·8 flies in every hundred became infected, the sexes being about equally implicated. The highest percentage of infected flies in any one of the positive experiments was 21 per cent, in Experiment 2501, and the lowest was 1·3 per cent, in Experiment 2592. If to the total of 1,102 flies dissected in the positive experiments be added *all* the Glossina used in *all* the negative experiments, we get a total of 1,722 flies employed, and 6·9 flies in every hundred infected.

It is perhaps worth noting that a diet for the fly of antelope, fowl, and monkey blood gave a higher percentage of *negative* results and a lower percentage of flies infected than a diet of antelope and monkey blood only. This was quite unexpected, for the Commission, as a result of many experiments and considerable experience, were of the opinion that fowl's blood assisted the development of *T. gambiense* in *G. palpalis.*

(4) *How does Sleeping Sickness Affect the Health of Antelope?*

The point is of considerable importance. If the disease killed the antelope within a short time of infection, or even if it seriously affected their health so as to render them incapable or unwilling to move about freely, the facts detailed above would lose some part of their practical value.

The word "health" is not used here in a technical sense—that is to say, the health was not estimated by a series of blood counts and temperature charts. Interesting as such observations would have been, the Commission regret they were too short-handed and too much pressed by other work to carry them out.

Careful observations were made daily to answer the following questions: Did the infected antelope during the time they were under observation appear sick? Did they become emaciated? Was there loss of health and strength? Were there corneal opacities, œdematous swellings, conjunctival discharges, or staring coats? These questions may at once be answered in the negative, except in the case of reed-buck 2,445, which will be referred to later below.

When the antelope were brought to the laboratory by the native hunters they invariably suffered from exhaustion, due probably to a combination of causes, such as fright, confinement

for two to four days in cages too small to allow free movement, insufficient water and food, and the rough usage undergone when being caught. As a result of these unfavourable conditions, each antelope was kept under observation for a week or two before any experiments were undertaken. During this time they were well fed and comfortably housed in reed kraals erected in a fly-proof house. Some of the antelope, especially the "oribi" and "entalaganya," died during the first fortnight. The eleven survivors were the subjects of these experiments.

Nine of these buck were kept under daily observation for four months after becoming infected with *T. gambiense.* They remained in perfect health.

The remaining two antelope were reed-buck. One, Experiment 2429, lived, and appeared very healthy, for ninety-three days after its infection. It then accidentally broke its leg and had to be killed. A post-mortem examination was made, and no evidence of trypanosomiasis was found. The other buck, Experiment 2445, arrived at the laboratory in a poor state of health, and died twelve days after its infection. There was no sign of trypanosomiasis at the post-mortem examination.

It is therefore evident that antelope infected with the virus of sleeping sickness may live in apparently perfect health for at least four months, and this, though they be kept under conditions less favourable than would occur in Nature, the constant handling and fly feedings to which these buck were subject being borne in mind.

(5) *Are Antelope Living in the Fly-Area Naturally Infected with Sleeping Sickness?*

Positive evidence on the last query would complete the chain of evidence that antelope living in the fly-areas may act as a reservoir of the virus of sleeping sickness. So far it has only been proved that they are "potential" hosts.

The only method by which this query can be investigated is by capturing game in the fly-area and then—

(1) Injecting its blood into animals susceptible to *T. gambiense* infection.

(2) Feeding cages of clean laboratory-bred *G. palpalis* on the newly-killed buck, and subsequently endeavouring to infect animals susceptible to *T. gambiense* with these flies. (The Commission

know by observation that *G. palpalis* will feed readily on animals newly killed.)

Those who know the local conditions will appreciate the difficulty of carrying out these methods of investigation. It would be necessary for large drives of the buck to be organized in the fly-areas. Several hundred natives would be required. Large numbers of clean laboratory-bred Glossina must be available, many normal susceptible animals must be in readiness, and, at the same time, be so situated that they cannot be bitten by the possibly infected wild flies in the neighbourhood. The laboratory work in hand may have to be abandoned for the time being, and some fifty or sixty buck must be captured or killed before reliable information is forthcoming. The sun is hot, the country very difficult, and the exposure to the bites of the fly very great.

It may be said at once that the Commission were only able to shoot two buck on the Lake-shore. The blood of these gave negative results for *T. gambiense* when injected into susceptible animals. One of them, however, gave a positive result for *T. vivax*. This trypanosome was proved by the Commission[1] to be not uncommonly carried by wild Lake-shore *G. palpalis*. It is, therefore, not unreasonable to suppose that at least one of the buck shot had been fed on by the Lake-shore fly.

It was recognized at length that occasional week-end shoots by a member of the Commission were quite inadequate. The assistance of the Acting-Governor of Uganda, S. C. Tomkins, Esq., C.M.G., the Acting Principal Medical Officer, Dr. C. Wiggins, of the Uganda Medical Staff, the Provincial Commissioners of Kampala, F. A. Knowles, Esq., C.M.G., and L. H. Cubitt, Esq., and of Sir Apolo Kagwa, K.C.M.G., the Prime Minister, was then sought to aid in organizing a series of large drives of wild game in the fly-area in the neighbourhood of the laboratory. We are greatly indebted to these gentlemen for their ready efforts on our behalf, which resulted in a large drive being organized. Unfortunately, the Commission were ordered to leave the country before the drive could take place. The work on these lines, however, is being continued by Dr. R. van Someren, of the Uganda Medical Staff, and Captain A. D. Fraser, R.A.M.C., who were instructed to take over the laboratory work.

This very difficult question, therefore, still awaits its answer.

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[1] *Vide Roy. Soc. Proc.* B, 1910, vol. lxxxii, pp. 63-66.

Conclusions.

(1) Water-buck, bush-buck, and reed-buck can readily be infected with a *human strain* of the trypanosome of sleeping sickness by the bites of infected *G. palpalis.*

(2) One exposure to the bites of infected flies is sufficient to infect an antelope with the virus of sleeping sickness.

(3) Though the blood of an antelope may be proved to be infected with *T. gambiense*, careful and continued examinations over prolonged periods may fail to reveal the presence of a parasite in the blood.

(4) The incubation of the disease (sleeping sickness) in antelope is probably seven days.

(5) Antelope of the water-buck, bush-buck, and reed-buck species, when infected with the virus of sleeping sickness, can transmit the infection to clean laboratory-bred *G. palpalis.*

(6) This transmission of the infection to clean laboratory-bred flies may occur at least eighty-one days after the last feed of the infected flies on a buck.

(7) *G. palpalis*, when infected with the virus of sleeping sickness obtained from the blood of infected antelope, are capable of transmitting the virus to susceptible animals.

(8) An appreciable percentage of *G. palpalis* will become infected with the virus of sleeping sickness should these flies feed on antelope suffering from this disease.

(9) It follows, from the above conclusions, that antelope living in the fly-areas are "potential" reservoirs of the virus of sleeping sickness.

(10) No antelope up to the present has been found naturally infected with *T. gambiense*.

THE TREATMENT OF SYPHILIS AT THE ROYAL INFIRMARY, DUBLIN, BY INTRAVENOUS INJECTIONS OF SALVARSAN.

By Captain A. T. FROST.
Royal Army Medical Corps.

Salvarsan came into use at the Royal Infirmary, Dublin, on February 1, 1911, when a small quantity (20 grm.) was obtained for the treatment of a few cases which had been a long time in hospital, and had proved refractory to mercury.

The method employed in this hospital is that used at the Military Hospital, Rochester Row, London, viz.; intravenous injection of an alkaline solution of salvarsan in physiological saline solution, 50 c.c. of the solution containing 0·1 grm. of the drug. (See Journal of the Royal Army Medical Corps, vol. xvi, p. 351).

When 0·4 grm. of salvarsan is given, the average quantity of fluid injected is 250 c.c., that is, 200 c.c. salvarsan solution and 50 c.c. saline fluid to wash all the salvarsan into the veins. Varying strengths of saline were used with the salvarsan, in the endeavour to eliminate the reaction; sixty-eight doses were given with saline solution containing 0·7 per cent of sodium chloride, forty-four with 0·6 per cent. As no appreciable difference in the reactions could be made out between any of these strengths, a return was made to the original solution containing 0·85 per cent sodium chloride. The important point appears to be that when all apparatus and solutions are germ-free and freshly sterilized before each set of injections, and in addition all solutions are freshly prepared, the number of severe reactions becomes practically nil. In the last 100 cases there has not been one, in the first 100 there were three severe reactions, with high temperature, collapse, severe vomiting and diarrhœa lasting some six hours. The question of the cause of these reactions has given food for much thought, and one is compelled to believe that the disease has a large influence in their causation. Occasionally only one case out of six injected at a sitting has shown a reaction, and invariably it has been the one showing the most active signs of syphilis. May it not be due to the syphilo-toxins from the killed treponemata? In support of this theory is the fact that a negative Wassermann may become positive after a dose of salvarsan.[1]

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[1] Major L. W. Harrison, R.A.M.C., *Brit. Med. Journ.*, 1911.

That dead organisms in the water used to prepare the saline solution are sufficient to cause a reaction was proved when giving a series of salvarsan injections at an out-station. As the supply of distilled water was insufficient rain water was substituted. Unfortunately this was not examined until after use, when it was found to contain large numbers of bacteria and moulds. This water, sterilized by the autoclave, was employed in six cases, all of which had fairly severe, though not serious, reactions. The six patients injected on the day before and the six on the day following, had no reaction of note; the solutions for these cases had been made with germ-free water. Moreover, while the six injected with rain water as a diluent felt ill for three days, the other twelve cases were normal on the following day.

The water we are using at present is tap water which contains practically no organisms or salts, and answers the purpose as well as distilled water. It is proposed to use a candle filter for a series of cases and note the reactions, the solutions will still be autoclaved as at present.

The method of dosage which was adopted for the first 100 cases was to give two doses of 0·4 grm. salvarsan with an interval of nine to ten days and await results, but the occurrence of a few relapses amongst these cases made it seem necessary to give mercury, to destroy the organisms which were not got rid of by the salvarsan—treponemata which are shut off from the blood stream by plasma cells or fibrous tissue.

Hence, nine weekly injections of 1 grain of mercury in the form of mercurial cream, are now given immediately after the two intravenous injections of salvarsan.

For purposes of comparison, and to show the different effects of the drug on syphilis in its various stages, cases presenting primary, secondary, and tertiary signs of the disease have been collected into separate groups. The occurrence of sensory lesions is of such interest that these have been also dealt with separately.

Primary Cases.

An attempt was made to diagnose every initial lesion microscopically. Two methods were employed—the dark ground illumination, and Burri's Indian ink. A considerable number of the men had used either Condy's fluid or one of the mercurial preparations for some time before coming under observation. This rendered diagnosis by the microscope more difficult. In a few of the cases, however, in which antiseptics had not been used on the

sore for a week, treponemata were discovered before the onset of the secondary stage.

The dark ground illumination was used with much success. At first an acetylene light was employed, but was replaced by incandescent gas, as the definition of the *Treponema pallidum* was much better than by the acetylene light. Neither of these sources of light is entirely satisfactory, compared with the illumination of a Nernst electric lamp. During the summer months recourse was had to the direct rays of the sun with a large stand condenser. An illumination was obtained which equalled the electric light, though not so constantly available.

Burri's Indian ink has proved most satisfactory, and is a very rapid method of demonstrating the organism. Many varieties of Indian ink have been tried, but the ink which has answered best is Gunter and Wagner's commercial ink, Pelican brand, waterproof. The dilution of one part of serum to two of Indian ink is the most satisfactory, as this gives a clear even field with the minimum of diluting ink. To get a film of the thickness necessary to demonstrate the *T. pallidum* most easily the quantity of the mixed ink and serum should be very small, just enough to spread over the whole slide and no more, otherwise the layer of ink will obscure the spirals and lessen the number of positive results. The colour of the film thus prepared is a dark brown and quite transparent. In twenty-four cases examined by this method and controlled by the dark ground illumination the results were similar. The average time required for finding the *T. pallidum* was ten seconds. In most cases, however, the organism could be detected almost immediately. Where no dark ground condenser is available, the Indian ink method is a cheap and efficient aid to diagnosis, and is more reliable than dark ground illumination unless the source of light is electric or sunlight.

Up to date there have been thirty-three cases of primary syphilis treated with salvarsan; the *T. pallidum* was found in twenty-eight of these.

Of the five negative instances, one gave a positive Wassermann reaction and the other four had typical hard chancres, which had been acquired over fifteen days previously.

Nine months have elapsed since the first of these cases had the "606" treatment, four months in the case of nine others, of which only one has shown any occurrence of secondary signs, and in him it was not quite certain that these were syphilitic when he received his injection. Somewhat severe reactions were observed in two.

Primary Cases.—No. 85, Private C., admitted to hospital with gonorrhœa, April 8, 1911. Developed a hard sore during the time he was in hospital and was diagnosed syphilis on June 2, 1911. He was anæmic and debilitated, and gonorrhœal orchitis still existed. *Treponema pallidum* was not found, owing probably to permanganate irrigation treatment for the gonorrhœa.

June 26, 1911. He was given 0·4 grm. salvarsan at 2.30 p.m. At 5 p.m. a rigor began, which lasted for three hours. At 6 p.m. he vomited for two hours. When the patient was seen at 7 p.m. he was in a collapsed condition, and cyanosed. He was given 15 minims of ether subcutaneously. He slowly recovered, and though very weak was fairly comfortable by 8 p.m. Temperature at this time was 104·2° F. The inflamed testicle became tender and swollen three hours after the dose of salvarsan, and in less than twenty-four hours had become quite soft and nearly the same size as the unaffected left testicle. The question of including this case amongst the primary syphilitic ones was decided by the fact that the usual time of onset of secondary infection of the testicle is three or four months after the primary infection, sometimes a little earlier.[1] In this particular case the onset of the orchitis could not have been more than two months from the date of infection. If the condition was syphilitic it is one of the earliest cases of syphilitic orchitis noted. The sore healed rapidly, and in six days the patient was appreciably less anæmic. He was inspected on October 2, and showed no signs of active syphilis, and looked in good health. However, his Wassermann reaction (as modified by Lieutenant-Colonel Birt, R.A.M.C.) was strongly positive, November 12, 1911.

No. 86, Lance-Corporal S. J., was admitted to hospital on May 9, 1911, with a typical hard chancre in the coronal sulcus. He was anæmic, even more so than the last case. The glands of his groin and axilla were hard and shotty. He lost weight weekly, and the anæmia became more pronounced. Owing to previous treatment *Treponema pallidum* could not be found, though searched for repeatedly.

He was given 0·4 grm. salvarsan on June 22, 1911. Soon after the injection he had a severe rigor, and vomited for two hours. Mental and bodily depression was a prominent feature for hours after the injection. Next morning the anæmia was still more

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[1] D'Arcy Power, "System of Syphilis," vol. ii, p. 147.

marked than before. Twenty-four hours later the sore was softer and drier. It had completely healed in twelve days. Extensive herpes on both lips and on the tongue developed in thirty-six hours; this cleared in a week. Patient was discharged from hospital on July 12, 1911, still anæmic, but slowly improving. No active signs of syphilis were present. He was seen on October 25, 1911, when he appeared to be quite well. Wassermann reaction positive.

Both these cases were treated on separate days; others injected at the same time and under like conditions had only slight or no reactions. A second dose of salvarsan was not given as it was thought that these two cases might have an idiosyncrasy to arsenic; they were used as controls to the others. Up to a month ago neither of them had any mercury; they have now been put on a course of mercury (intramuscular) as the blood reaction is positive.

It has been noted in all the cases that the chancres became soft in twenty-four hours, but that healing of the ulcer did not proceed at a very rapid rate. Calomel powder was used to dust over the sore, and it may have been too irritating, for when a less irritating form of mercury was substituted cicatrization was more rapid. Calomel is now used for the first few days and replaced by the less irritating calomel lotion. Some experiments were tried with the local application of salvarsan to sores which contained *T. pallidum*, and other spirochætes. The sores dried up after one application, but the results were not lasting. This may have been due to the very small quantity of the drug applied (it was only the trace left in the mixing glass) or to the very dilute solution.

The other primary cases presented no particular points of interest; all are still under observation, and have not shown any further signs of the disease. Nine of the cases have remained free from active syphilis for five to seven months since they were treated.

Secondary Cases.

Owing to the overlapping of secondary and tertiary syphilis only those early secondary cases which showed the ordinary signs of the disease are included under this heading.

One hundred and eighty-four cases of early secondary syphilis were injected with salvarsan; no symptoms of any importance ensued. Most of them were given two doses of 0·4 grm., with an interval of seven to nine days between them, followed by nine injections of mercurial cream, one grain of mercury in each. The average time which elapsed before all signs of the disease had

disappeared was 9·1 days after the first dose. The most common interval was seven days, but the average was raised by papulo-squamous rashes, which were found more intractable than any of the other syphilides. However, in future these will give less trouble as the local application of an ointment containing ammoniated mercury or calomel causes these rashes to disappear as rapidly as any of the others. In four cases the sores took over three weeks to heal, though the induration was less marked in twenty-four hours after the injection. A suggestion has been made that iodide of potassium given at the same time as the salvarsan may intensify its action, by absorbing newly formed and partially organized fibrous tissue, and thus allow the drug to gain access to the *T. pallidum*.[3] This is being tried in all cases at present.

Eye and Ear Affections.

The following six cases occurred during the first month or two after salvarsan was injected. They were also amongst the first hundred cases which were treated with salvarsan alone. At the outset we were inclined to impute the serious eye and ear affections to the drug, but the effects of further treatment with salvarsan proved that syphilis 'not arsenic' was the causative factor.

No. 9, Lance-Corporal N., was admitted into hospital on January 16, 1911, with a chancre, a papular rash, mucous patches on both tonsils, and melancholia. He was given two mercurial injections without much improvement in the lesions or the melancholia. On February 12, 1911, he was given 0·4 grm. salvarsan; this was followed by a slight reaction, temperature 101·6° F. The notes record that the chancre healed in four days, the rash had disappeared in ten days, the tonsils were clear in sixteen days, and that the melancholia had disappeared in a few days after the treatment. He left hospital free from active signs on March 10, 1911. Two months later he was admitted into the general wards with vomiting, dizziness, and headache. He could not stand or turn round sharply without supporting himself with his hands. Six weeks from the date of admission he was discharged hospital, but was still dizzy, and suffered from noises in the ear. On September 21, 1911, he returned to hospital with mucous patches on both tonsils, and the condition of his hearing unchanged. September 21, 1911, he was given 0·4 grm. salvarsan. No reaction. Next day all trace of tinnitus had gone. A third dose, 0·4 grm., was injected

[3] G. H. Mills, *Guy's Hospital Gazette*, December 9, 1911.

on October 2, 1911, and the patient was discharged hospital on October 6, 1911, free from active signs, and ordered to commence mercurial treatment.

No. 18, Corporal F., was admitted to hospital on February 28, 1911, with giant papular rash on his face and body, severe ulceration of both tonsils, and debility. On February 28, 1911, 0·3 grm. salvarsan was injected; this was followed by a slight reaction, temperature 100° F. The throat ulceration had ceased to extend in twenty-four hours, and healed in four days. The papular rash took much longer to disappear, quite a month. Two and a half months later he was readmitted with deafness and vertigo. On May 8, 1911, he was given 0·3 grm. salvarsan; this was followed by a decided improvement in his hearing and the dizziness became less. On May 24, 1911, a dose of 0·3 salvarsan was given which further improved the ear condition. This patient was discharged on June 13, 1911. His hearing was practically normal, and he had gained 10 lb. in weight. On August 15, 1911, he was free from signs and seemed to be in robust health.

No. 20, Private Q., was admitted to hospital March 7, 1911, with a granulomatous sore, a papular rash over the body and limbs, and anæmia. On March 7, 1911, 0·4 grm. of salvarsan was injected. Reaction not severe. Three days later a decided improvement in the anæmia was noticeable. The sore did not heal well, it was septic and there was much œdema of the penis. The actual sore had healed by March 21, 1911. On April 29, 1911, a second dose of 0·4 grm. was given. His weight had gone up 15 lb., from 123 to 138 lb. in six weeks. On May 1, 1911, he was clear of active signs and discharged hospital. He was re-admitted four months later with subcutaneous gummata on both shins and was treated for a fortnight with potassium iodide; this removed the gummata. Eye symptoms developed about August 20, 1911, and on examination double optic neuritis was found to exist. On August 21, 1911, he was given 0·3 grm. salvarsan; a distinct improvement was noted by the ophthalmoscope and also in his vision within three weeks. A fourth dose of salvarsan, 0·45 grm., was injected on September 21, 1911. Eyes almost normal. Fifth dose, 0·4 grm., given October 2, 1911.

The patient was discharged from hospital on October 5, 1911. Vision normal, no ophthalmoscopic signs of optic neuritis. He is now undergoing a course of nine weekly injections of mercurial cream, 1 gr. of mercury in each. His blood gave a negative reaction on November 20, 1911. This case has had five intravenous injections, equal to 1·95 grm. of salvarsan.

No. 22, Private R., was transferred to this hospital, March 25, 1911. He had had nine mercurial injections and iodide of potassium since the appearance of the secondary signs. Condition on that date: Thick papulo-squamous rash on the front of the body, corymbose syphilide on the back. There were mucous patches on both tonsils, and perianal condylomata. On March 25, 1911, 0·3 grm. salvarsan was injected. In five days all active signs had disappeared, leaving the skin pigmented where the rash had been. He was discharged on April 1, 1911. Re-admitted on May 10, 1911, with deafness and headache. The deafness was very marked, he could not hear a watch ticking at one inch distance with either ear. On May 12, 1911, he was given 0·3 grm. salvarsan. Improvement began within twenty-four hours, and on May 18, hearing was normal when tested by a watch. On October 18, 1911, he had a third dose—0·4 grm., no active signs being then visible. He is now undergoing weekly injections of mercurial cream.

No. 24, Private B., was admitted on March 28, 1911, with a hard sore, mucous patches on both tonsils, condylomata, syphilitic alopecia, and anæmia. On the same day he had 0·3 grm. salvarsan. The above signs had all disappeared by the tenth day with the exception of the chancre, which healed on the fifteenth day. Iritis of the left eye developed about April 15, 1911. Posterior synechia was also present, which took a week to break down with atropine. On May 1, 1911, well-marked optic neuritis of both eyes was noted, worse in the left eye. May 9, 1911, 0·4 grm. salvarsan was injected. In four days the iritis was distinctly less. May 15, 1911: Vision in both eyes $\frac{6}{18}$. Optic neuritis was less in both eyes, but still marked in the left. One month after the onset of optic neuritis his vision was normal and no ophthalmoscopic signs of the lesion remained. He was discharged without any active signs of syphilis on June 12, 1911.

No. 90, Private D., was admitted on June 26, 1911, with a papulo-squamous rash over chest and limbs and severe headache. In addition there was marked depression. On June 28, 1911, he received 0·3 grm. salvarsan; this was followed by a sharp reaction, temperature 103·6° F., a rigor and severe headache for half an hour. Though the rash and headache disappeared in a few days, the depression was unchanged. On July 10, 1911, he was given a second dose of 0·3 grm., and was discharged on July 13 with no active signs of syphilis. He was still suffering from depression. No mercury was given at any time to this patient.

While stationed at Kildare he suddenly experienced a severe

pain in the right ear, followed in a short time by complete paralysis of the right seventh and eighth nerves. When inspected on December 16, 1911, he was found to be suffering from complete facial paralysis and optic neuritis in both eyes. Hearing had improved in the right ear. He could hear a watch ticking at an inch, the normal distance at which the tick of the watch should be heard being 18 inches.

It will be noticed that the dosage of these cases, with one exception, was small, and the interval between the first and second doses long. Also that no mercury had been given to any of the cases after the "606." They belonged to the first hundred on whom the effect of salvarsan alone was tried, as already stated.

Tertiary Cases.

Twenty-four cases of tertiary syphilis were treated. The average number of grains of mercury each had received was 16. This does not mean that the patient was neglected and did not receive the usual mercurial courses prescribed in the Army, but that one-third of the tertiary lesions (seven of the twenty-four cases) occurred within one year of the primary chancre. The largest mercurial dosage in any one case was 46½ grains.

The following are some of the most interesting of these cases:—

No. 3, Private D., had been suffering from syphilis for fifteen months, and shown active disease for nearly a year. He came under observation on December 29, 1910, for salvarsan. The treatment up to this time, as shown on his Syphilis Case Sheet, was mercurial cream containing 16½ grains of mercury, iodipin eight injections, soamin 170 gr., and one course of Zittmann's treatment. His soft palate, tonsils, and naso-pharynx were represented by a huge sloughing ulcer. The movements of the jaw were limited to about half an inch. Speech was almost impossible, and consisted in a slur, difficult to understand. Iodides and mercurial injections had no effect, they were tried for one month before the arseno-benzol was given.

February 3, 1911.—He had his first injection of 0·4 grm. No reaction. Temperature was normal. Healing began within twenty-four hours, and was extraordinarily rapid; ten days later there was little granulating surface to be seen.

February 24, 1911.—Given 0·42 grm. salvarsan. No reaction. In the twenty-one days since the first dose he has gained 6 lb. in weight.

February 26, 1911.—He could eat and drink without holding his nose, which had been the only method of preventing regurgitation of food until February 14, 1911. He spake without difficulty, and could enunciate almost as well as a person with a normal palate. He could also open his mouth to the full extent. Discharged hospital in twenty-three days.

This case has been seen regularly, and without any further treatment has remained free from active signs. Wassermann reaction (Lieutenant-Colonel Birt's modification) was negative before and after treatment for nine months; it has since become positive.

No. 13, Lance-Corporal L., was transferred to the Royal Infirmary on December 29, 1910. He was suffering from perforation of the hard palate, the necrosis slowly extending along the middle line towards the incisor teeth. He had at the same time gummatous ulceration of the dorsum of the tongue and mercurial stomatitis. Anæmia and debility were pronounced. As this patient had a thorough course of mercury and iodides, it was considered that more good would result if extra food and tonics were given for a time, especially as he was sensitive to mercury. At the end of six weeks there was no change in the condition of the case. On February 12, 1911, he received 0·2 grm. salvarsan. The reaction was severe, viz:—temperature 104° F., rigor and vomiting, followed by collapse. Next morning he felt and looked better. On February 22, 1911, 0·18 grm. salvarsan was injected; this was followed by a slight reaction only. All ulceration had ceased and the patient was discharged from hospital on February 27, 1911, free from active signs. Readmitted to hospital on April 13, 1911, with further palate ulceration. He had been taking alcohol to excess, and had lost 4 lb. in weight. He was given 0·4 grm. of salvarsan on April 13, 1911. Profuse bleeding from the palate and nose resulted two hours after the injection. Next morning the perforation of his palate, which before the injection had looked foul and sloughing, showed a clean granulating surface. In seven days the edge of the perforation was completely covered with epithelium. Discharged hospital in ten days.

He was readmitted two and a half months later with ulceration of the alveoli, gummatous periostitis, and necrosis of the two upper incisor sockets with loss of the teeth; these signs had been present for fourteen days. He was at once given an injection containing 0·2 grm. of salvarsan. Reaction—bleeding from the ulcerated surface. In the next week there was no further advance of the disease,

and he was given a fifth dose of 0·2 grm. He complained of a pain in the chest for a short time after the injection. On July 18, 1911, he received a sixth dose of 0·2 grm. When about three-quarters of the dose had been injected, the patient complained of very severe pain in the back, which extended to both legs. The pain was so severe that he could not walk. Massage of the back and legs gave some relief, and the patient got back to bed. The pain recurred once or twice in a less degree during the next four hours. On the following morning he appeared to be quite normal. None of the other cases of the same day showed any reaction. During the following six weeks, iodides and half-grain doses of mercurial cream were given. The dead bone came away a month after the sixth dose of salvarsan. He was discharged hospital September 8, 1911.

What struck one in dealing with this man was the fact that on each readmission he showed marked signs of recent alcoholic poisoning. The dosage of salvarsan was small, but with the bad history of the case, and the broken-down condition of the patient, it seemed too risky to employ the quantity usually given to robust individuals. Lance-Corporal L. has been free from active syphilis for six months, without any further treatment.

No. 99, Shoeing-Smith P., was admitted to hospital with an injury to his left arm. He was thrown by his horse ten days before, and his arm was "pulled" by the reins as he endeavoured to hold the horse as he fell. There was a swelling like a hæmatoma in the biceps, with limitation of movement. In the course of a week this induration had involved the deltoid as well as some of the other muscles of the shoulder. There was nothing in his Medical History Sheet to assist in the diagnosis. He acknowledged that he had had a venereal sore some eleven years before, which healed so rapidly that he attached no importance to the abrasion. Examination of his blood by Lieutenant-Colonel Birt's modification of Wassermann's reaction showed a strongly positive result. On July 4, 1911, 0·3 grm. of salvarsan was injected. A sharp reaction followed with rigor and sweating. Within forty-eight hours the biceps was free, and could be moved through the normal angle, though previously he had been unable to raise his arm from his side further than a few inches. On July 12, 1911, the second injection of 0·3 grm. was followed by severe pain in the affected shoulder. Iodide of potassium was prescribed a few days after the dose of salvarsan. He was discharged in a month with complete movements of his arm, and nothing to be felt at the site of the gumma. On admission his weight was 148 lb., and in four

months he had added $29\frac{1}{2}$ lb. No mercury had been given in the interval. In consequence of relapses among those who were treated by salvarsan alone he is now going through a course of mercurial injections.

The remainder of the cases of tertiary syphilis showed no points of any special interest. All reacted with wonderful rapidity to the drug. From the time that the dose was given a marked improvement was noted, even as early as twelve hours after. The average time from the injection to the healing of the gummata was 10·7 days. Some were septic on admission; this complication added considerably to the time in healing, as salvarsan has had no effect on the pyogenic organisms associated with the *Treponema pallidum*. One case in particular illustrated this point. He was admitted with multiple subcutaneous gummatous ulcers of both forearms, in a septic condition. On the same day he had 0·4 grm. of salvarsan. During the night the gummata became very painful and red. The following morning the dressing was saturated with pus and the forearms looked much worse than on admission. However, in a week the affected area had healed. In all the other cases which were not septic healing began within twenty-four hours.

Relapses.

Among 186 cases which have been kept under observation there have been nineteen relapses. All these occurred in the first 100 cases, that is, among those who were treated with salvarsan without mercury. No relapses have been met with yet in the second hundred (treated by the combined drugs). The shortest time in which a relapse occurred was fifty-five days. The longest, up to date, was nine months. Five of these had only one dose of 0·4 grm., three had 0·8 grm. in two doses, and one had two doses of 0·2 grm. It was evident that those who relapsed earliest were the alcoholic subjects. Under the impression that they were cured, they indulged in all sorts of excesses immediately after leaving hospital.

This was the history in three of the relapses. The other recurrent cases must be accounted for by the fact that too small a dose of salvarsan was given and that mercury was not used in the treatment.

The commonest relapses were mucous patches in the mouth or on the tonsils and condylomata. Recurrence on the skin did not occur in any of this series. The relapses affecting the special senses have already been referred to, under the heading of eye and ear affections.

Hereditary Syphilis.

The above cases show that in acquired syphilis none have been refractory to the treatment. But in hereditary syphilis the experience of one case has borne out the observations of other observers, that interstitial keratitis does not respond to salvarsan. This is due in all probability to the anatomical difficulty of bringing the drug in close contact with the diseased cornea in sufficient quantity.

No. 15, Boy G., suffering from interstitial keratitis of four months' duration, was given 0·4 grm. of salvarsan on February 24, 1911, which was followed by no reaction. For six months following the injection there was no change in the cornea but since then he has been slowly improving under iodides and mercury. The dose was a comparatively large one for his age and weight. This completes the number of cases of syphilis treated by this drug 272, up to date.

Lymphatic Leukæmia.

One non-syphilitic patient suffering from this disease was injected as a last resort. No. 142, Boy C., was admitted into the surgical wards with a brawny induration, pain and stiffness of the right knee joint and pyrexia. He was profoundly anæmic, and a blood examination showed an advanced form of acute lymphatic leukæmia, symptoms of which he had had for three weeks. Blood count: Red blood-cells 1,250,000; white blood-cells 80,000, of which 96 per cent were lymphocytes.

On September 21, 1911, he was given 0·15 grm. salvarsan. During the administration of the dose the boy complained of severe pain in the chest, and nausea. The same evening his temperature was 105° F., but there was no further reaction. Next day his knee, which had been flexed before the injection, could be straightened, and there was no pain. In the following twenty-four hours all swelling had left the knee and free movement was carried out without discomfort or difficulty. Red blood-cells, 1,000,000; white blood-cells, 83,000. He vomited twice in the morning. The slight improvement in the boy's appearance was not maintained. The temperature fell to 99° F. for a few mornings, but rose to 103° F. at night. He was somnolent during both day and night. Red blood-cells, 900,000; white blood-cells, 43,000; 96 per cent lymphocytes; hæmoglobin 20 per cent. Normoblasts were present.

On the eleventh day after he had received "606" he suffered from pain in the chest, and vomiting became more and more frequent. Temperature changed from the hectic type to continuous pyrexia.

The patient died on the morning of October 7, 1911, sixteen days after the administration of "606." Post-mortem examination showed that the cause of death was acute lymphatic leukæmia, on which a general streptococcic infection had supervened.

This was not a fair test of the drug as the case was in the very last stage of the malady before he came under observation and treatment. Notwithstanding the rapid improvement in the knee condition, the enlarged glands of the body, were not diminished in size by the remedy.

CONCLUSIONS.

In common with other observers, our experience shows that salvarsan is a distinct advance in the therapeutics of syphilis. From a military point of view it is of great value, as the soldiers become efficient much sooner than when treated by mercury alone. The most important and encouraging fact is that the early treatment of the initial stage of syphilis prevents the onset of the secondary signs of the disease. If men could be induced to report themselves as soon as the disease becomes manifest, the prophylactic treatment by "606" would constitute an important advance in the treatment of syphilis.

The difficulty of getting hold of the cases early will persist as long as the present penalties are attached to those who have contracted venereal diseases. It would appear to be a justifiable conclusion that we have arrived at the stage when the routine use of the drug in the Army in all cases of syphilis should be recommended. In the selected lives met with in the services, very few would present contra-indications to the use of salvarsan.

As to the question of dosage. In the Royal Infirmary, perhaps an error was made in giving too small a dose in the early days. Now the routine is to administer two doses, each of 0·4 grm., or even a third dose with intervals of one week, followed by nine weekly injections of mercurial cream.

In conclusion, I wish to thank Lieutenant-Colonel Birt, R.A.M.C., for his valuable help and advice in carrying out the treatment, also Major D. J. Collins and Captain P. J. Hanafin, R.A.M.C., for their expert assistance in noting the progress of those cases of optic neuritis referred to in the text.

QUININE INJECTION AND TETANUS: A CRITICISM.

By Major F. J. PALMER.
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A memoir, No. 43, has recently been published by the Government of India detailing some experiments carried out in Kasauli by Lieutenant-Colonel Sir D. Semple, with a view to determining the relation of tetanus to the hypodermic or intramuscular injection of quinine.

In consequence of the conclusions formed by Lieutenant-Colonel Semple, the intravenous injection of quinine is recommended instead of the intramuscular, but the objections to the intravenous route for administration are many and serious, and it is doubtful whether it will ever seriously take the place of the intramuscular method as a popular means of exhibition. A hope is expressed that oral administration properly used will render any other method superfluous, but it is precisely in those cases where the oral route is inadmissible for various reasons, or has been tried and failed, that intramuscular administration finds its greatest field of usefulness.

Last hot weather in the plains it was my experience to see many cases of malarial hæmatemesis and melæna. Such cases are evidence of extremely severe malarial infection, and when admitted to hospital the patient is much collapsed, with extremely rapid pulse and every evidence of overwhelming toxæmia. All these cases were given intramuscular injections of the acid hydrochloride of quinine and all recovered. Again, of what use is the oral method of administration in that large clinical group of cases of malaria in which congestion of the liver and spleen with severe vomiting plays such a prominent part? In some cases the vomiting is most intractable. I have known it last for seventy-two hours and be but little checked by even large doses of morphine given hypodermically during that period.

No one would give an intramuscular injection of quinine lightly, or when oral administration was easy and sufficient; but I have mentioned these facts, which every tropical clinician knows only too well, merely to point out the seriousness of discarding such a valuable therapeutic weapon as intramuscular injection of quinine without the gravest possible reasons.

Granted that a few cases of tetanus have occurred, and these were spread over many years, is that in itself a justification for the prohibition of an old and well-tried procedure, unless it can be proved —and up to the hilt—that the incidence of this disease was not due to faulty methods of administration?

Notions of asepsis vary considerably, and I for one have never given an injection of quinine without preparing the skin of a patient as if he were about to undergo an operation.

Before I came to India I was repeatedly told that operation wounds would not heal properly in the hot weather, no matter what precautions were taken. My answer is that during the past hot weather I have, amongst other operations, opened three knee-joints for the removal of displaced cartilage with a confidence justified by perfect results, and this in the month of June in the plains with a failing monsoon.

I only mention this in order to emphasize the fact that what one man may consider a sufficient degree of cleanliness for intramuscular injection need not necessarily be such; if a higher degree of attention were paid to technique, such accidents (few in number as they really have been) would be probably still fewer or altogether vanish in the future.

The purpose of the present article is to point out that the conditions of some of the experiments were highly artificial, and in no way represent what occurs when an injection of quinine is given in the human subject.

Semple's paper opens with some general considerations to show that quinine injection has often been followed by tetanus. The author notes the effect of heat and cold on the development of the disease. He quotes Fourniers Pescay as stating that men marching under a hot sun developed tetanus next day. This proves nothing and indeed is susceptible of quite another explanation. Semple would seem to infer that the exposure to the hot sun on the previous day weakened resistance, and allowed latent spores to develop. Possibly it did so, but one might as well say that the influence of fatigue in causing the early appearance of fever in the course of an enteric attack is the cause that determines the onset of the attack. The truth, however, is that fatigue has converted what would normally have been the incubation period into a febrile one, but the disease was well on the road nevertheless, and the causative organism had obtained an unyielding hold upon the host. I have seen instances of this over and over again in enteric fever in the field.

Semple later states that eleven cases of tetanus following quinine injection were brought to his notice, and mentions that in one case he cultivated the tetanus bacillus from the distilled water in which the quinine had been dissolved. The number of cases in which tetanus has possibly occurred from latent infection can thus be reduced to ten. Ten cases occurring in the whole of India and spread over a series of years! The remainder of the introductory matter is given over to a consideration of the manner in which the toxin acts.

I shall now summarize shortly the various experiments set forth in the report. In all of these I have taken the amount of quinine given and have worked out the equivalent dose for a man of 10 st. weight. This has been done for the purpose of showing the relatively enormous dose of quinine injected, and the highly artificial character of the experiments, which have no parallel when a dose of 5 gr. (which is generally sufficient) is given in the human subject.

In the first group of experiments, Table I, quinine, in doses equivalent in man to 64 and 127 gr. respectively, was given one day before an injection of washed tetanus spores. One out of four animals given $\frac{1}{2}$ gr. of quinine (equals 64 gr. in man) developed tetanus. Comment: washed tetanus spores are not injected into the human circulation unless the operator uses unsterilized water, nor does one give doses of 64 or 127 gr., but only doses of 5 gr., and some clinicians have found even 3 gr. sufficient.

In Table II, injections of quinine equivalent to a dose of 64 gr. in man, were given daily to guinea-pigs previously injected with a non-virulent strain of washed spores. One out of three animals so treated developed tetanus. The same comment applies to this table as to Table I.

In Table III a more virulent strain of spores was used, and with daily injections of quinine equivalent to 64 gr. all four animals developed tetanus, and in one case bacilli were recovered from the site of injection.

In Table IV a dose of quinine, equivalent to 64 gr. in man, was given before an injection of spores. This was followed by daily injections of quinine equivalent to 64 gr. Two out of four animals developed tetanus. In this case one of the two control animals also developed tetanus, though no quinine had been given; there were thus 50 per cent of infections in both the experimental and control animals, and the result of this experiment is valueless except to show that the injection of washed spores is not always the harmless

procedure Semple would have us believe, and that, as 50 per cent of this series of animals injected with spores but no quinine developed tetanus, a liberal discount must be made for the effect of quinine in some of the cases in which both quinine and spores had been given.

In Table V six animals were given quinine equivalent to 64 gr. daily. In two the injection was commenced the day before, in two at the same time, and in two a day after the injection of washed tetanus spores. All these animals developed tetanus. This experiment seems much more conclusive than the previous ones, but again the dose is relatively enormous, and in the hypothetical explanation of tetanus supervening after quinine injection the spores have not been injected a few days previously, but hypothetical months.

In Table VI the effect of the cold chamber was tried on an animal into which washed spores had been injected. In another case ½ gr. of quinine was given as well. The two animals developed tetanus. Again the dose is relatively enormous and the tetanus infection simultaneous with the quinine injection.

The seventh series of experiments proves nothing that the originator desires, but goes far to vitiate most of his other experiments, as two controls developed tetanus at the same time. This again shows that the injection of washed spores is not always as harmless as the author would have us believe. In this connection refer also to Table IV, where half the controls developed tetanus.

Table VIII: A tetanus *culture* and not spores was used upon this occasion. A quarter " c.c. " was given, and, when local tetanus was marked, six of the animals were injected with ½ gr. of quinine (equivalent to 64 gr. in man). All died. A *control* animal to which no quinine had been given also died the same day. In five out of six cases a culture was made from the site of injection, but bacilli were not recovered from the blood. Comment is needless here. One does not give large doses of quinine when tetanus is present. Note also that the control died.

Table IX: Practically a repetition of the preceding experiment. A culture was injected, and quinine 1 gr. (equivalent to 127 gr. in man) was injected on the same day. Bacilli were recovered from the injection site, but *not* from the internal organs.

Table X: Quinine, morphine, lactic acid, and saline solution were injected into guinea-pigs. Half an hour later an injection of washed spores was given, with the result that the animals which received quinine and lactic acid developed tetanus, and those

which had received morphine and saline did not. The quinine given was ½ gr. (equivalent to 64 gr. in man). Again the dose is enormous, and, as no proof is given that the organisms developed locally at the site of the inoculation of quinine, the results may conceivably be due to phagocytic paralysis, the result of quinine or acid toxæmia. The experiment, however, is a suggestive one, and I shall return to its fuller consideration later.

Table XI: Semple considered that the effect of quinine might be due to local destruction of tissue at the site of injection providing an anaerobic focus, and possibly in part to phagocytic paralysis. Three animals were injected with ½ gr. of quinine mixed with washed tetanus spores, and all developed the disease. Three in whom morphine was mixed with the spores did not. This experiment is a conclusive one, but again the dose is relatively enormous, and the advocates of intramuscular injection do *not* propose to inject tetanus with their very much smaller doses of quinine, but instead maintain that insufficient asepsis, and the introduction of tetanus spores *locally*, at the site of injection, is the cause of the rare instances of tetanus that have been recorded in this connection.

In Table XII three monkeys of weights 12 and 14 lb. were injected at two different sites with 4 gr. of quinine (equivalent to 64 gr. in man) on three successive days, and also injected with tetanus spores. All developed tetanus, and the bacillus was recovered from the site of injection, but cultures made from the blood proved negative. The site of injection of the spores is not mentioned.

This is obviously a matter of extreme importance, as it makes all the difference whether the spores were injected at the same spot as the quinine or at a distance. Note also that as the blood cultures were negative there could not have been a large number of spores or bacilli in the blood to be carried into a distant focus, and there find a nidus for development.

Table XIII: The right hind leg of animals previously inoculated with spores was cut into, and a piece of subcutaneous tissue and muscle removed from the site of a previous injection. Eight animals were examined and a positive culture was obtained in all. The longest interval after injection was six months. This is obviously a most important experiment. If one may make a comment here it is that in a laboratory where investigations are being frequently carried out on a spore-bearing organism like tetanus, and in such a spot as a guinea-pig's groin, soiled with fæcal matter often con-

taining the same organism, the danger of contamination must be extreme. Why did not Semple here perform the crucial experiment of taking a series of animals in which he had injected spores some some months before, and inject them *in another part of the body* with quinine in something even approaching the quantity in which it is given in the human being? Had tetanus then developed the hypothesis of encysted spores in an old wound area springing into activity under the influence of a quinine injection in another part of the body would have been very hard to discredit.

Table XIV: The heart blood of three of the animals mentioned in Series 12 was examined with a negative result. Evidently very few organisms enter the blood from these old injected areas, and unless organisms are present in the blood in some number it is unlikely that one will be carried to a distant small necrotic area and there develop, producing tetanus.

Table XV: Cultures made from emulsions of the fæces of ten guinea-pigs proved positive in four cases. In three of these the bacillus was of virulent type, in one case non-virulent. This experiment has an important bearing on the next series.

Table XVI: Injections of $\frac{3}{4}$ gr. of quinine, repeated in two days, were given to four guinea-pigs. In one case a virulent culture of tetanus was recovered from the site of injection. The dose here would be equivalent to one of 96 gr. in a man 10 st. in weight. The experiment, however, is a very important one, and obviously requires corroboration. Semple thinks the bacillus came from the intestine, but no attempt was made to prove that this animal's intestine contained tetanus bacilli prior to injection. It may possibly have been introduced locally, and the obviously correct thing to do would be to inject quinine in a series of animals which had been definitely proved to harbour the tetanus bacillus in their intestinal contents.

Table XVII: Four guinea-pigs were given an injection of $\frac{3}{4}$ gr. of quinine in the chest, which was repeated after two days. Cultures from the site of injection were negative, as were also those of the intestinal contents.

Table XVIII: The intestinal contents of ten guinea-pigs were examined. In only one was the result positive, and in this case a virulent culture was isolated. Why did not Semple here endeavour to corroborate his result in Experiment 16 by giving quinine injections to this animal, or why did he not give quinine injections to an animal previously fed with tetanus spores?

In Table XIX two animals were given a dose of antitoxin

followed by an injection of tetanus culture, and next day an injection of $\frac{3}{4}$ gr. of quinine. Both guinea-pigs remained well, and the antitoxin is thus considered an efficient prophylactic. He recommends 10 to 15 c.c. as efficient for two or three weeks.

The question of a lethal dose of quinine is then considered, and 1 gr. per 150 grm. is mentioned as a large dose; which there is little doubt of, as it is equivalent to a dose of 426 gr. in a man of 10 st. weight! In the guinea-pig 1 gr. per 233 grm. of body weight has been sometimes lethal. In rabbits 6 gr. per kilo of body weight is a certain fatal dose.

Having now finished a recapitulation of this series of experiments, it is very difficult to see upon what grounds the hypothesis of infection, under the influence of quinine injection, from a depot of latent tetanus spores, has been deduced. In the whole series there have been only one or two results which in the least tend to support that view, and in these no attempt has been made to corroborate the result by a further series of experiments. One thing the experiments do show clearly, and that is, that quinine in relatively *enormous* doses predisposes to tetanus infection; but so would possibly many other poisons if given in equally large doses. Quinine is a potent protoplasmic poison; witness its action upon the malarial parasite, and in another direction upon germinal cells. That it may induce paralysis of the phagocytes is quite possible; that it may even produce a minute amount of tissue necrosis at the site of the injection I see no reason to doubt, and indeed regard as proved, but that into this minute area tetanus bacilli from a minute wound inflicted months before, and healed at the time of injection, are likely to be carried is extremely improbable. What is the condition of a healed wound which is presumed to contain encysted spores, and at the same time allows these spores to constantly wander through the circulation for months without detriment, to be eventually carried into the capillary leading to to the minute area of necrosis produced by, let us say, a 5-gr. injection of quinine? Why was no attempt made to corroborate the few inconclusive results which are alone consistent with this view? The doses given to the animals experimented on have no parallel in the human subject, and are relatively enormous. I have calculated their equivalent on the basis of a guinea-pig of maximum, and a man of almost minimum, weight. In many cases the doses must have been much greater than this. One thing indeed the experiments show clearly, and that is, that the tetanus spores or bacilli injected along *with* quinine in the same spot almost certainly

induce tetanus if the dose of quinine is a large one, and possibly if it is a small one. They go very little further than this at present. Many men with a large experience of the intramuscular injection of quinine find it rarely necessary to give more than 5 gr. at a single injection, and I have heard one say that 3 gr. is sufficient. Surely the amount of necrosis produced by these doses would be so minute that the necrosed area would be absorbed before a wandering bacillus could find a nidus there.

Remember also that all cultivations from the blood proved uniformly negative. And it is on account of such so-called proof that the use of this valuable method of medication has been forbidden. Granted even that there were an extremely small chance of developing tetanus, would it not be better to run a one in a thousand chance of dying of tetanus, to a one in four, let us say, of severe malarial melæna? The past malarial season, owing to the unusual climatic conditions, has been an extremely mild one. I hope that before the next one arrives it will be left to the medical officer upon the spot, faced as he may be by the issues of life and death, to do his best for his patient untrammelled by orders possibly based upon faulty premises. Let there be the most scrupulous care in the disinfection of the patient's skin, let the syringe and quinine solution be properly sterilized, and it is the belief of many that we shall have heard the last of the bugbear of quinine and tetanus.

It is only a few years ago since I heard a well-known surgeon maintain that silk should never be used as a suture material in hernia cases as it absorbed germs from the neighbouring bowel. Very few surgeons whose asepsis was beyond reproach would maintain that view now.

I know one officer who, after a plague inoculation, had an area of necrosis at the site of injection, evidenced by intermittent discharge for six months. Every time I perform an operation and ligature a vessel, I leave in a wound a much larger area of tissue bound to undergo necrosis than would be produced by a five-grain injection of quinine, and every time I embed a ligature of iodine or chromic catgut I leave a certain amount of dead organic matter in the wounds. Presumably the soldier is subject to as many cuts and scratches and other minute wounds as any other mortal.

Why do not the tetanus spores emerge from their hiding places and get into these spots so favourable to their development? It is because they have not been introduced *directly* into the wound. Are we going to stop plague and possibly even enteric inoculation,

and all surgical procedures, because a minute area of necrosis may be produced by them. Tetanus has been known to occur in operation wounds sometimes, but on nearly every occasion in which this has taken place the bacillus has been isolated from the suture material.

There is another aspect of the question, and that is a clinical one. We are told to use intravenous injection. An intravenous injection is a much more troublesome thing to give than an intramuscular one, and the temperature of the fluid injected when given without special apparatus must always remain a matter of conjecture.

In a collapsed subject the entering of the lumen of a shrunken vein with a needle is not as easy as one might *a priori* imagine, and it is often necessary to expose the vein by a minute cut in such cases. Again, in a child's arm the vein is not always easy to find. Let me give a personal experience of the occasional impossibility of giving an intravenous injection which may sometimes be experienced. Last September a gharri drove wildly up to the hospital in which I happened to be at the time. In it was a distressed father holding a writhing child in his arms. The little one, a child aged 3, had been unwell that morning, and had fallen down in convulsions. Its temperature was 104° F., and the child certainly looked as if it had not long to live. A certain circular had been issued a week before, and I was not allowed to give what I should have otherwise given at once—an intramuscular injection of quinine. As rapidly as possible a douche can with rubber tube attachment and needle were sterilized, but all this meant time. When all was ready I attempted to plunge the needle directly into the median basilic vein, but owing to the incessant convulsive twitchings of the child, was unable to do so; I then made a small incision exposing the vein, and plunged the needle into the vein, but, owing to the convulsions, no matter how the child was held, the needle point jabbed in and out of the vein piercing the vein wall in various directions, and it was evident that most of the fluid, when running at all, was leaking into the tissues beyond the vein wall to there produce the necrotic area we had just been told of. As well have a necrotic area in muscle as around a vein wall, so 3 gr. of bihydrochloride of quinine was got ready for injection, and, as the child seemed about to cease breathing, the exposed vein wall was incised. Blood immediately spurted up 3 ft. in height, as if an artery had been wounded. It was evident that, even if the injection could have been forced into a vein under such pressure, it would

have never reached the general circulation, but would have been dammed back in the peripheral veins. The child still looked as if about to die, so the 3 gr. of the bihydrochloride was injected into the left arm. Within half an hour the convulsions ceased, and the child made a rapid recovery. In this case intramuscular injection was the only possible procedure, as intravenous injection failed.

This is an extreme case, but has been mentioned to show that an intravenous injection may occasionally be a more difficult matter than one might imagine. This paper is a plea for untrammelled clinical action in cases of extreme gravity, and in those only. It may well conclude with the above narration of a clinical case.

PRACTICAL HINTS ON MARCHING AND HEALTH ON ACTIVE SERVICE.

By G. FAHEY.
Late 88th Connaught Rangers.

(*Continued from p. 289.*)

PART II.

THE FEET COVERINGS.

For successful marching, the make, shape, and material of the boots that are worn are of the highest importance, for no matter how anxious a man may be to become a good marcher, he cannot succeed if his boots are not of the right sort. This has long been recognized by the authorities, as shown by their desire to improve on the present regulation infantry boot.

Despite, however, much that has been spoken or written on the defects of the "ammunition boot"—as it is usually called in the service—it is, in my opinion, if properly fitted and cared for during its period of wear, the boot most suited for marching and withstanding the rough wear and tear that a service boot is subjected to. It is strong, easily fitted, and adapted for packing away in kit-bags, important considerations in a military boot.

This opinion may not coincide with that of the recruit when making his first acquaintance with a pair of new "ammunition" boots as issued to him by the quartermaster of his unit, for, like most other articles issued from the military stores, they take some time to get used to. Most old soldiers will retain lively recollections of trying to dry themselves on a new army towel, or of trying to sleep between a new pair of barrack-room sheets. The coarseness of these articles when new makes them anything but comfortable to use, though when they have been in use for some time they become softer and more easy to use.

To attempt a long march in a pair of new infantry boots would be disastrous to the wearer. They should be worn for a time about the barrack square or camp, and blacking should never be applied to them till they have been worn for a fortnight or so. Dubbin, or any grease which has no salt in it, should be rubbed into them daily till they have shaped themselves to the feet. If the boots must be polished, then start to use the blacking. The use of the grease will not prevent them from polishing, for after it has been discontinued for a few days the boots will take the blacking, and the polish will be of a deeper lustre than if no grease had been used. Afterwards,

an occasional application of grease will keep the boots soft and add to their period of wear.

It would be well, however, if blacking was never used at all on the boots, except for a pair in use for walking out. One pair should be kept for parades, manœuvres, &c., which should never have had blacking applied to them, but kept greased, and worn always about camp or barracks, and so kept ready and fit for any long march the men may be called on to perform. Boots that have been lying by for some time become hard, and creases form in them, or the inner soles crumple up, causing discomfort to the wearer when taken into use again.

Whilst on the subject of blacking for boots, I have reasons to believe that corns are either caused by its use or the pain of a corn is accentuated by something used in the manufacture of boot blacking. I have always been troubled by a corn on the centre of each of my small toes, for which I have used a corn solvent. This has always enabled me to pull the corn out by the roots, but it has always grown again. Just before leaving for South Africa I discontinued the use of blacking, and during the three years I was campaigning in that country the corns never troubled me again. Since, however, I have come back and re-started the use of blacking the old favourites have reappeared, as painful as ever. I noticed during the war that very few men suffered from corns, and in most cases they were as painless as corns or hard skin on the hands.

When fitting boots a good rule to go by is to feel that the toes can be moved slightly inside the boot, that the eyelet holes nearly meet across the instep, and that the heel is held firmly. If a boot is loose about the heel it will produce friction when marching and cause blisters or chafe the skin.

The feet expand from much marching and exercise, so that whilst a size seven boot may fit the recruit on joining, it will be found that a larger size will be required later on. Many men refuse to recognize this fact, and go on forcing the size seven boots on their developing feet, causing themselves much pain and discomfort and destroying their marching efficiency.

The heels should never be worn higher than the regulation pattern as issued from stores—about 1¼ in. High heels, by throwing the weight of the body forward unduly, not only cause sore toes when marching, but are also fatiguing to the body in general, by causing an unnatural gait. Instructions should, therefore, be given the shoemaker when having boots re-soled and heeled, not to make the heels higher than they originally were. Most shoe-

makers—regimental ones particularly—have a partiality for raising the heels of boots from a quarter to half an inch above the original height when resoling and heeling.

In lacing the boots the laces should not be brought up further than the centre hole; and enough lace should be left to encircle the boot, the knot being made in the centre. This will be found to give more freedom to the instep, besides preventing the knot being forced on the flesh by the legging, and thus causing a hard and painful lump to form. Where leggings have not been superseded by putties—a much more comfortable, smarter, and useful leg covering—it will be found that the hard ends of the leggings, pressing against the heels or instep, are often painful and cause chafing of the skin. This is caused by the legging being laced too tightly at the bottoms, and it is a good plan if the feet are sore from this cause to leave the bottom holes of the leggings unlaced.

When in camp or on manœuvres, if a spare pair of boots are carried they should never be left outside the tent exposed to the sun, especially when they have been soaked with water, as the leather shrinks, cracks, or hardens, making them very uncomfortable to wear. I am not in favour of a spare pair of boots being carried for manœuvres, as one good serviceable pair of boots should be sufficient to last any manœuvres that may be likely to take place at home. On service one pair of boots may often have to last, with continual daily marching, for months, so that it is well to accustom the soldier to the care of his one pair of boots, so as to last out, should occasion arise, for a long period of marching.

When dubbin is not obtainable for use, a piece of fat from the camp-kettle at dinner-time, rubbed into the boots whilst warm, and after the dust has been brushed off, will keep them soft. The fat should be rubbed well into the uppers and the welt between the uppers and soles, to prevent them splitting at the sides—a common occurrence when boots are subjected to heavy work without having been well greased.

The boots should not be removed from the feet directly on arriving in camp or bivouac and whilst the feet are warm. This is bad both for the feet and the boots; as the latter, if moist with perspiration and allowed to stand till next morning, become stiff and hard, while the feet themselves get soft. It is far better—unless the feet are blistered and sore so that they require attention—to keep on the boots till retiring for the night. By this means the boots will be kept in better condition, and be found more easy to wear again for the next day's march.

Many men's feet are ruined by the habit of removing their

boots after the completion of the day's march and wearing slippers about the camp, the boots being left about perhaps in a hot sun, so that when taken into wear again next morning, instead of a soft and pliable boot being ready for the day's work, which would be the case had the boots been greased and kept on the feet till bed-time, a boot with the uppers full of hard creases, the inner sole warped up and split, with the toes pointed up, has to be forced on to a foot made tender by the easy comfort of a soft slipper worn, perhaps, on a sun-scorched ground.

It may, of course, be necessary to remove the boots for the purpose of washing the feet, or trimming the toe-nails, but this should be done after the feet have cooled down, and the boots replaced again on the feet to be worn till retiring for the night.

Sore heels are often caused by an accumulation of dirt underneath where the heel rests, especially in men who perspire much. The congealed mass of dust, worsted from the socks, and perspiration not only makes the heels sore underneath but causes blisters at the back. To prevent this, the accumulated matter should be occasionally removed with a knife and the inside of the boots washed with a rag dipped in warm water.

When sleeping in tents, the boots should not be left in the centre of the tent, as they may be crushed out of their natural shape by being sat or trodden on. The safest method is to place them at the back of the head, near the tent flies, with the uppers downwards so as to prevent any water dripping into them should it rain. Besides preventing them from being crushed, they will be more easily found should there be a night alarm and a sudden order to turn out. When sleeping in bivouac, the boots are best kept underneath the blankets or other covering, as otherwise, should there be a heavy dew during the night, they may be found sopping wet in the morning.

Like the boots, the regulation pattern of socks—thick seamless worsted—are about the best that can be worn. Thin socks allow the seams of the boots to be felt more acutely, and therefore the feet are more likely to become blistered or chafed. If through excessive perspiration of the feet, thick worsted socks cannot be worn, thin woollen ones may be tried, though it is well to accustom oneself to the use of the regulation ones, as on service no others may be obtainable.

The only fault I have found with the regulation socks is their tendency to shrink. Oft times I have found that the heels dwindle away till their position is shifted to the centre of the foot, and the top of the uppers comes level with that of the boots. This does not

happen with every pair, so that it must be from some defect in their manufacture. To guard against this it is advisable always to obtain a large pair and soak them in water before using them.

On no account should cotton socks, especially coloured ones, be worn. Cotton does not absorb the perspiration like wool or worsted, but instead becomes stiff and hard. Socks that have been darned should not be worn for long marches, however desirable, from an economic point of view, they may be at other times. It is far better to start a march with new socks or ones that have only been worn a short period, as the part that has been darned is likely to blister or chafe the feet. When holes appear in the socks and it is possible to obtain new ones, it is better to do this than patch up the old ones.

At night in tents the socks should not be placed under the head—a common practice—as they get crumpled up into hard creases, caused by the perspiration, which will cause discomfort on the morrow's march. They should be placed with the boots behind the head, or better still, if a cross-bar has been affixed to the tentpole, hang them through the loop of the haversack or belts.

PART III.

CARE OF THE FEET AND SKIN ABRASIONS.

Having dealt with the coverings of the feet, the next thing to consider is the care of the feet themselves. It is deplorable to see, as is frequently the case, men of good physique and in every other respect good and well set up soldiers, incapacitated from duty after a few days' hard marching owing to bad feet, while men poorly endowed by Nature as to physique and strength are still able to keep their place in the ranks.

The possession of a good pair of feet is such an important item in the marching efficiency of a soldier, that I am glad to see the suggestion that certain men in each regiment should be trained as chiropodists has been acted on by the authorities. At the same time, however, I am of opinion that if men took a little more care of their feet and boots there would be little necessity for calling in the services of the chiropodist. I will, therefore, endeavour to show how the feet may be kept in good condition.

Before proceeding on a march the soldier (and these remarks may also apply to the Volunteer when about to start on his annual camp) should get his feet in trim. He should bathe them in warm water, to which, if he suffers from corns, a little soda should be

added. This will soften the corns so that they may be pared more easily. This is best done with a small corn razor, but care should be taken not to cut too deep. The toe-nails should also be cut, especially those of the great toe.

Cleanliness of the feet is imperative in those who wish to become good marchers. Cold water should always be used, except for the purpose, stated before, of softening corns. Cold water by keeping the skin hard renders it less likely to blister than if warm water is used. For those who suffer from excessive perspiration of the feet frequent bathing in cold water, with a fresh change of socks after each bath, will often effect a cure. The best time to bathe the feet is an hour or two after arriving at the end of the day's march, when the feet have cooled down, though it is not necessary to bathe them daily. If the feet are hot and sore, adding a little permanganate of potash to the water and allowing the feet to dry naturally without the use of a towel will effectively ease them. If a basin or bucket cannot be had for bathing the feet in, fill your canteen with water, add the permanganate, and pour the mixture over the feet.

The method employed in South Africa, where water and utensils were scarce, was to fill an empty biscuit-tin with potash and water, which was left outside the hospital tent for anyone who wished to bathe his feet. I can hardly recommend this method, as I do not think there could be much curative power left in the water after a hundred or so men had dipped their perspiring feet into it. I am rather inclined to think it would have the opposite effect.

Permanganate of potash goes such a long way—an ounce would be sufficient for fifty different occasions—that I would advise each man to carry a quantity in a small box in his haversack for use when he required it.

A little vaseline rubbed, when retiring for the night, on the soles of the feet or under the toes, if they are sore and scalded in that region, I have always found effective in easing them, and putting the feet right for the morning.

Scalded soles are generally caused by perspiration accumulating on the socks, to prevent which a soldier should always carry a spare pair of socks in his haversack, if he is marching without any other clothes than he stands up in, as will often be the case on service. An extra shirt or pair of drawers is a superfluity which can be dispensed with when occasion arises; but an extra pair of socks is an indispensable necessity. As soon as the socks begin to get soppy with perspiration, they should be changed and washed at the first

opportunity. The period that socks may be worn varies; some men may wear them without any discomfort for a fortnight of continuous marching, whilst others who perspire more require to change them every second or third day.

I am not a believer in the old method of rubbing soap on the socks. I invariably found that soap made my feet soft, so I always evaded the order to soap my socks, which, some years back, was generally issued as a prelude to a long march. I never knew the method to be a preventative against blisters, chafes, or scalding, but usually found that it aided all three. I never saw anyone using soap to his socks on active service, and am glad to see that its use is no longer recommended or enforced. If, whilst on the march, proper care is taken of the boots and the feet, and a few simple rules followed, there will be little occasion for soap, foot powders, or any other substance inside the sock.

Wearing slippers about camp after a long march, especially on hot and hard ground, injures the soles of the feet and puts them out of condition for the morrow's march. If the feet require easing, it is better to sit or lie inside the tent with the boots off, or if slippers must be worn, wear them in the evening only, when the ground is cool.

Slippers with gutta-percha soles should on no account be worn; as it is a well-known fact that gutta-percha if worn on a hot or dry surface draws and retains the heat and injures the soles of the feet. This advice is hardly necessary to the regular soldier nowadays, as he is supplied with leather-soled slippers. In Volunteer camps, however, it was usual to see men wearing slippers with gutta-percha soles. I should, therefore, advise Volunteers not to take slippers of this class to a camp if they value the comfort and health of their feet. Slippers are a luxury easily dispensed with in camp, or on service. They were the first articles I always rid myself of in South Africa when I wished to lighten my kit, nor did I ever feel the loss of them. I noticed also that the men that marched well and were seldom troubled with sore feet never carried slippers. If the boots are well looked after they may be kept as comfortable for wear as any slippers.

It will often happen on service that men will be compelled to sleep in their boots, perhaps, for weeks at a stretch, at times when the close proximity of the enemy makes a night attack probable. It is at times like these that the soldier, if he has neglected to take proper care of his feet and boots, will be subject to much discomfort. If he has been in a stationary position during the day, the discom-

fort of sleeping in boots will not be very great, but if, as may be often the case, he is on the march, it will be felt much more.

If sleeping in boots is the order on the march, it is always well, if water can be had, to bathe the feet when opportunity occurs after arrival in camp, or bivouac, and if the socks require changing to do so. If water is scarce, a little poured from the water-bottle or canteen over the feet will suffice. It is extraordinary how a little water, when it is scarce, can be made to go a long way. I have often had a complete bath all over, with a canteen full of the then precious liquid.

The bootlaces should be loosened slightly before lying down to rest, and the putties need not be worn so tightly as when actually on the march.

When campaigning in cold climates or where the exigencies of service entail a lot of marching through or standing about in slush or snow, the boots should be greased both inside and out, and if vaseline can be obtained, or any pure fat, it should be rubbed on and between the toes. This will act as a preventative against chilblains, an ailment which is likely to cause much suffering, and is the cause of a large number of men being rendered temporarily unfit for service when exposed to the rigours of a campaign in a snow-covered country. Besides preventing to a certain extent chilblains, if the feet and boots are kept greased the toes are less likely to be attacked by frost-bite, another and more severe complaint, which is to be guarded against when campaigning under these conditions.

If the boots let in water, and there is no way of having them repaired or changed whilst on the march, it will be found that the mud, as it dries on the socks, makes them hard and causes sore feet; the socks should be brushed with a stiff brush or rubbed together before putting them on in the morning, so as to get the dirt out. It is also advantageous to brush the inside of the socks at other times, especially when it may not be convenient to wash them; by keeping them free from dust they are not so likely to irritate the feet.

Sometimes great inconvenience is caused by a nail making its appearance through the sole of the boot whilst on the march. The simplest method to remove this is during a halt to take off the boot and place a copper coin over the nail, and a small stone on top of this to fill in the space between the coin and the uppers; then strike at the stone through the leather with a piece of wood, or another stone. If the offending nail is near the heel it can be got at much more easily.

A simple, but effective, method of treating blisters is to draw a piece of worsted through the blister with a needle, and squeeze all the water from under the skin, leaving it perfectly dry. It is an old-fashioned cure, but I have seldom seen it fail. Care, however, should be taken not to use a dirty or rusty needle.

A great deal of discomfort to the soldier on the march is sometimes caused by scalding or chafing of the skin in the neighbourhood of the anus or between the thighs. This is often caused by the jagged edges of the inner seams of the trousers rubbing against the skin. Where khaki or drab clothing is worn the discomfort is not so much felt, the material being softer than that of the dark blue or green cloth trousers worn on home service.

It is usual, or was when cloth clothing was worn for manœuvres, to wear the oldest clothing for marching, as good clothing would be rendered unfit for ordinary wear by the dirty roads and rough work of camp life. Old or worn trousers, however, are likely to cause the wearer considerable suffering which could easily be avoided by a little attention bestowed on them before proceeding on the march.

The inner seams should be pressed, and any jagged edges should be cut. If the seams are hardened by congealed perspiration, they should be brushed and washed with warm water and soap before being ironed. If drawers are worn, scalding of the skin is not so likely to occur; but some men cannot, or will not, wear drawers.

The trousers should be braced well up but not too tightly. The general tendency is to wear them loosely braced on the march, which is wrong, as the friction against the skin is thereby increased.

Despite all precautions, however, chafing or scalding of the skin is likely to occur, especially in men who are very fleshy about the thighs, or who walk close-legged. In this respect, I have noticed that very few men whose legs have a tendency to be bow-shaped suffer from scalding of the skin.

When the skin is scalded, a little vaseline rubbed into the affected parts before going to bed will relieve the smarting, and restore the skin to its normal state by the morning. I have always found vaseline more effective in this respect than powders or Fuller's earth.

A treatment for abrasions of the flesh which I have seen old soldiers use is to apply wet pipeclay of a moderate thickness on the affected spot and allow it to dry and cake on. I have seen many a severe abrasion relieved by this treatment, though on hygienic grounds it does not seem advisable, as the pipeclay may not be perfectly clean, and in that case likely to set up more serious trouble.

(*To be continued.*)

United Services Medical Society.

THE MEDICAL SERVICE WITH LORD METHUEN'S FORCE DURING THE ADVANCE ON KIMBERLEY, 1899.

By Lieutenant-Colonel C. H. BURTCHAELL.
Royal Army Medical Corps.

Meeting held on January 10, 1912.

(*Continued from p.* 313.)

Battle of Modder River.

The Argyll and Sutherland Highlanders detrained at Honey Nest Kloof, and joined the Division in bivouac at Witkoplaagte after dark on the evening of November 27. On the morning of the 28th the mounted troops and Royal Field Artillery moved from Witkoplaagte at 4 a.m. The other troops began to move about 4.30 a.m. The general line of advance was in the direction of Modder River railway bridge.

About 5.30 a.m. the cavalry were checked by rifle fire from several points on the banks of the Riet River.

About 7 a.m. a party of the enemy with a gun and a pom-pom was seen about half a mile east of the centre of the north and south reach of the Riet River. This gun was brought into action, but under fire of the 18th Battery R.F.A. retired in an easterly direction. The composition and movement of this party of the enemy coincided with certain portions of the conflicting information the General had received, and tended to confirm his belief that the right bank of the river was occupied—if occupied at all—by only a weak rearguard.

Shortly after 7 a.m. the infantry began to arrive on the battlefield. The march of the Guards Brigade was directed towards, approximately, the centre of the space between the railway bridge and the point where the Riet River turns sharply to the west. The 9th Brigade was on the left of the Guards Brigade and advancing more or less along the railway towards the bridge.

The Guards Brigade began to deploy when near the road running east from Bosman's Drift, about 2,200 yards from the river bed. Very soon afterwards, at 8.10 a.m., the enemy suddenly and quite unexpectedly opened very rapid rifle fire from their completely concealed positions all along the left bank of the

Riet River, supported by gun and pom-pom fire from the right bank.

Two companies of the Scots Guards with a machine-gun succeeded in reaching the bank of the Riet River near the reservoir. They suffered considerably, and the men of the Maxim-gun detachment were all killed or wounded. Four companies of the same battalion were sent to assist this party, and later, the 1st Coldstream Guards moved to the right in support of the Scots Guards. From this force some officers and men crossed the river, by wading chin deep, but they were compelled to recross to the left bank as the river was quite impassable for troops in that neighbourhood.

The Grenadier Guards, 2nd Coldstream Guards, and left companies of Scots Guards gradually advanced to within 1,000 yards of the Boer trenches on the south bank. The 1st Coldstream Guards and the rest of Scots Guards, facing east, held the river from near the bend up stream to the vicinity of the reservoir. The brigade remained in that position all day.

The 9th Brigade crossed the railway line and gradually worked up under heavy fire to points varying from 1,000 to 600 yards from the enemy's position west of the bridge. The hut and farmhouse 300 yards south of the left bank of the river, opposite Rosmead village, which were strongly held by the enemy, were captured by two companies of the Yorkshire Light Infantry about noon. At the same time the ground on the left of the hut was gained by the Loyal North Lancashire Regiment.

Later on, parties of these and other battalions, led by Major-General R. Pole-Carew commanding the 9th Brigade, crossed the river by the dam at Rosmead. They were reinforced by 300 sappers[1] under Major G. F. Leverson in command of the 11th Field Company, R.E., and subsequently, during the afternoon, General Pole-Carew advanced with a force, made up of men from various corps, along the right bank as far as Frazer's Farm. This force had to fall back on Rosmead village owing to want of support.

About 4 p.m. Lord Methuen was wounded when in the area occupied by the 9th Brigade.

When the fight began the 18th and 75th Batteries R.F.A. came into action close to the railway on its eastern side about 2,500 yards from the river. Shortly afterwards they moved up to 1,700 yards, and later on the 75th Battery went forward under

[1] Drawn from the 8th, 11th, and 31st Companies, R.E., which had been kept in rear ready to work on the railway.

heavy fire to the line held by the Guards Brigade, and unlimbered within 1,200 yards of the trenches. The 18th Battery subsequently came up to a position about 200 yards to the left rear of the 75th, and opened fire at 1,400 yards. About 4 p.m. the 75th Battery fell back a few hundred yards, owing to casualties and want of ammunition.

At 10.15 a.m. two guns of the 18th Battery had been sent to support the left flank of the 9th Brigade, and came into action south of Rosmead.

Shortly after 2 p.m. the 62nd Battery[1] R.F.A. arrived and opened fire 1,200 yards from the river on the west of the railway. The 12-pounder 12-cwt. naval guns which had been brought up from Enslin by rail came into action west of the railway, about 3,000 yards from the bridge, and later moved back to about 4,800 yards.

During the afternoon the enemy's fire slackened, and at dusk the situation was as follows :—

The Guards Brigade concentrating near the reservoir; some 1,200 men of the 9th Brigade in and about Rosmead, and the remainder of the brigade under orders to cross the river by the drift at that place; parties of the enemy were seen moving in the direction of Jacobsdaal.

Later in the evening the enemy completely evacuated their positions.

The 1st Battalion Highland Light Infantry arrived on the battlefield, by rail, after dark.

The total casualties were :—

	Killed	Wounded	Total
Officers	3	20	23
Other ranks	66	394	460
	69	414	483

Of the above, five wounded were not admitted to hospital; one officer and eleven other ranks wounded died in the field hospitals, and two officers and eighteen other ranks returned to duty in the field. The strength of the troops engaged was about 10,191.

The casualties were almost equal on each side of the railway line. The Argyll and Sutherland Highlanders suffered the heaviest loss, 15 killed and 101 wounded; the 2nd Coldstream Guards 10 and 59; the Yorkshire Light Infantry 9 and 52; 3rd Grenadier Guards 10 and 50; 1st Scots Guards 9 and 41; Northumberland

[1] This Battery had marched direct from Orange River, a distance of 52 miles, in twenty-eight hours.

Fusiliers 11 and 36; R.F.A. 3 and 28; Loyal North Lancashire 3 and 16; 1st Coldstream Guards 0 and 21; the remaining wounded were R.E. and R.A.M.C. 3 each; Remington's Guides 2; 9th Lancers and A.O.C. 1 each.

Regimental Medical Service.

Taking the units from east to west in their position on the map of the battlefield the narratives of the regimental medical officers are as follows:—

9th Lancers—Captain J. V. Forrest: "The cavalry on the right flank were not heavily engaged. They drew a lot of shell-fire but without much damage to the men. Several horses were killed or wounded."

Scots Guards—Captain S. Guise Moores, R.A.M.C.: "We did not expect to find the enemy entrenched on the Modder and Reit Rivers. The battalion had not long deployed when the Boer rifles belched forth a stream of lead. The rear company had reached the line of the reservoir situated on the left bank of the last-named river when this happened. At the same time the 'pom-pom' opened fire, the first shells from which put out of action the maxim gun and its detachment—except the black driver.

"A regimental collecting station was at once formed on the south or protected side of the reservoir embankment, and wounded soon began to arrive there.

"The stretcher-bearers were, at the onset, with their companies; the stretchers had been issued to them that morning before marching. Owing to the flat nature of the field of battle and the absence of cover, except an occasional ant-heap or the low scrub, the stretcher-bearers of the Guards Bearer Company were unable to render any help to the battalion in the day's proceedings. Any attempts of the stretcher squads or ambulance wagons to move forward brought on them the attention of the enemy, and they had to desist.

"The reservoir collecting station became, as the day advanced, a dressing station for the brigade, and wounded were gradually brought in by the regimental stretcher-bearers who were with their companies. They were mostly brought in by hand. Amongst them were Captain Elwes and Lieutenant Hill, the former with a penetrating shell wound of the skull, and the latter with a pom-pom wound through the biceps near the right elbow. The hæmor-

rhage from this wound was so great as to require continuous digital compression of the brachial artery for some hours.[1]

"About 3 p.m. the Boers got round our right flank and fired into the wounded, then laid out in rows along the base and sides of the embankment. Captain H. C. Lowther, Scots Guards, happened to be near a Maxim which was situated at this spot, and worked it so efficiently as to eventually drive the enemy off, but not before some of the wounded had been hit a second time.

"When the flank attack commenced, the wounded were gradually conveyed into the basin of the reservoir. The enemy, attracted by the energetic movements on our part, directed shell fire at the reservoir. This, though disconcerting, happily did not do much damage, and it was only considered necessary to move a few cases into the keeper's hut, situated on the left bank of the Riet River, and only a few yards from the reservoir.

"By this time the stock of dressings in the surgical haversack and medical companion had given out, and resort was had to the panniers.

"At nightfall the keeper's house was full of wounded, and wounded were also laid out all round the building. "The panniers had been placed in the centre of the largest room, and patients requiring it were re-dressed, Major T. B. Beach, of the Guards Brigade Bearer Company, giving most timely and valuable aid. The spirit stove, 'spirits,' and kettles were produced from the comfort panniers, and during the whole night bovril and cocoa were made and given to the patients.

"This dressing station was not more than a mile from the Boer trenches, and yet it proved to be on the whole a haven of comparative, if not actual, safety, in an area in which every movement from the prone position brought an accession of rifle fire.

"Chief points of interest were :—

"(1) The distribution of the regimental stretcher-bearers, who deployed with their companies, and were fortunately the right men in a tight place.

"(2) The regimental collecting and the brigade dressing station being in one, and very close up to the firing line.

"(3) The almost insignificant part which the bearer company took in the removal of the wounded from the collecting station, till

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[1] Captain S. G. Moores was wounded while attending to this officer, but was not incapacitated for duty.

the battle was over, owing to the topographical conditions and its close proximity to the enemy.

"(4) The great use of the 'panniers,' and more especially the 'comfort panniers,' in providing dressings and stimulants for the wounded under unexpected and difficult circumstances."

1st Coldstream Guards—Captain Hooper with the regimental stretcher-bearers followed the battalion along the bank of the Riet River, and later on helped at the reservoir, where the regimental bearers brought the wounded whenever opportunities occurred.

3rd Grenadier Guards—Captain Profeit: "When we got well in sight of Modder River, and were under the impression that the Boers had gone, we were suddenly told that the river was strongly held and that the brigade was to deploy for the attack. The stretcher-bearers seized their stretchers and followed in rear of their companies. I had my corporal and orderly with me carrying the companion and haversack. About 1,500 yards from the river, the fire was very hot, my orderly had a bullet through his helmet which rather astonished him, and the stretcher-bearers extended so as to take advantage of any slight cover that could be found. About half a dozen wounded were attended to there, those who could walk were sent back to the field hospital, and those who could not took cover under the nearest friendly ant-heap. The battalion came to a standstill, and lay within about 1,000 yards of the Riet for the rest of the day. Very few wounded were passed back, as no sooner did a stretcher squad, or even a man, move than a hail of bullets was the result. Some, however, filtered away to the dressing station at the reservoir."

Royal Field Artillery: A number of wounded collected about an overturned wagon in the vicinity of the guns in rear of the 2nd Coldstream Guards. They were dressed by Major H. L. Battersby, R.A.M.C. Several less severely wounded were carried back on empty ammunition wagons.

Northumberland Fusiliers—Captain D. D. Shanahan: "The fight was over a level plain. There was no cover with the exception of an occasional ant-heap. Touch with the stretcher squads was lost almost at once. Almost immediately I lost my orderly, who was severely wounded, and then had to carry the field medical companion and water-bottle myself. Later a man who was assisting me to dress a wounded man and bring him under cover was himself wounded, and the wounded man was hit a second time. The field was swept with bullets. I, like everybody else, was compelled to lie as close as possible behind any cover which could

be found, and for the remainder of the day only attended to casualties in my immediate vicinity. The wounded had to remain where they were hit, and this was the safest and the best for them. In the part of the field where we were, to ask a M.O. or a stretcher squad to go to their assistance would mean a complete 'mop up' of the whole. The comrades of a wounded man, lying close to him, would not bless you, as it meant a concentrated fire on any spot where a man showed himself.

"It was not till late in the afternoon, when the fire got slack, that one could move with any degree of safety. It was only then that the stretcher squads could get to the wounded, and remove them to shelter, where they could be picked up later by the bearers of a bearer company. Fortunately we were able to collect our wounded before darkness came on, but it was a long time after dark before the last was transferred to the field hospital."

Argyll and Sutherland Highlanders — Captain J. E. Carter, R.A.M.C.: "We advanced in extended order on the west of the railway, forming the second line. Several men were wounded by shell fire at about 3,000 yards range; I got three of them under a culvert and attended to their wounds and then proceeded to join the attacking party about 1,000 yards in advance. All along the fire was very heavy. An absolute hail of bullets came along every few minutes, due to someone exposing himself in front. When this happened I lay flat and pushed on when the fire slackened. I did not see the regimental stretcher-bearers after the wounded were placed under the culvert, but the regimental medical corporal—Mennitt—and Private Carlyle, my orderly, kept close to me throughout. On the second ridge I dressed several wounded, but when anyone lifted his head for a moment he immediately attracted a storm of bullets. I was lying near the 5th Fusiliers on the right of the 91st. A Staff Officer rode along in front of our line attracting fire; when he came opposite us bullets came hailing round. Later a man came along looking for a doctor. I went with him, running bent double, and found the man shot through the thigh. He got his wound when looking for a doctor for the above Staff Officer, who had been wounded. I saw another man fatally wounded, who had been in the line of fire directed at the Staff Officer. My wounded man told me where this Staff Officer was. I went on to search for him but heard that he had gone back. I realized the utter impossibility of removing wounded from the front while firing was going on, and I directed a wounded man to lie where he was in partial cover and not to expose himself in trying

to get back. Towards the evening some water-carts were brought up; the men rushed for them, they could not be kept back, and thus attracted fire; in one party of eight, two were killed and five wounded and one of two Kaffirs. At dusk I went with wounded to the dressing station at the hut on the south bank of the river near Rosmead. The battalion bivouacked near the dam. Bully beef and biscuit were issued about 9 p.m. and later a ration of rum. The men had been without food since noon the day before, when they had their dinner at Orange River—a fast of some thirty-three hours, only broken by a canteen of tea given them by the K.O.Y.L.I. on their arrival at Witkoplaagte the previous evening."

King's Own Yorkshire Light Infantry—Lieutenant G. B. Crisp, R.A.M.C.: "We were in the front line on the left of the advance, west of the railway. At first we did not have a very great number of casualties, thanks to a convenient slight ridge in the ground which we reached before the Boers opened fire, and then their artillery fire was all going over us. For a long time it was just a question of occasionally groping one's way along behind this ridge, attending to the few casualties as they occurred, making them comfortable as best one could and then lying still again. When word came along that the memorable hut near the river was to be assaulted I went along in the rush with the others. Lieutenant Fox, K.O.Y.L.I., who led the assault, was hit when close to the hut, shot through the arm at short range. His arm though badly shattered was subsequently saved. Near the hut we found Colonel Northcott,[1] just after he had been hit. There was no stretcher near, but I had my two orderlies with me and we carried him into the hut. Other wounded rapidly collected. For a long time after I first got there the hut was under a pretty hot fire, and after this ceased there was one persistent sniper who went on at it. Finally, with my glasses I spotted him sitting up in a tree on our side of the river. I found three men who were marksmen and lent them my glasses in turn till they had all spotted him, and then I had the satisfaction of seeing them tumble him out of the tree.

"Towards nightfall two ambulance wagons arrived at the hut and took the two wounded officers and some of the seriously wounded to the field hospitals.. The whole afternoon casualties were coming in on stretchers, gates, &c., and at night there were about seventy wounded in and around the hut. It had three rooms, very small and dark, with mud walls. An opening in the posterior

[1] D. A. A. G., 1st Division. Colonel Northcott died in the field hospital next day.

wall in the direction of the river bank had been used as a 'bolt hole' by the enemy. The rooms were filled with wounded and the rest were laid out all round the outside.

"I had sent for my Scotch cart with the medical pannier, and it arrived soon after dark. The panniers were invaluable and enabled a great deal to be done for those wounded who remained out at the hut all night.

"To turn to the light side of this place of suffering: A man was sent down to the river for water just after dark. He returned in a great fright saying, 'Please, sir, I can't go near it, there's a crocodile there and he's lashing his tail.' It turned out to be a wounded Boer pony."

Loyal North Lancashire Regiment—Lieutenant W. Jagger:—"We were on the extreme left of the 9th Brigade, and had some casualties when the enemy opened fire. The difficulty of dressing them was extreme. There was no cover at all. The stretcher-bearers were no help during the trying time before we crossed the river. Good sound, sensible men should be chosen as stretcher-bearers. Though men are plucky with a rifle they sometimes lack determination when unarmed under fire. More attention should be paid to the training of regimental bearers in first-aid. After dressing my wounded I left them in charge of a stretcher-bearer who was ordered to hail the first ambulance he saw. I then crossed the river. After the check to our advance from Rosmead, I recrossed and found my wounded on the south bank had been collected by the bearer company. Some of them we took to the hut, where I spent the whole night with Crisp dressing and nursing wounded of various units.

"We caught some chickens in Rosmead, boiled them and made broth. We gave the meat to those who could eat it, and with bovril, milk and brandy from the panniers, we managed to feed all the wounded at the hut."

11th Company R.E., Lieutenant A. Chopping, R.A.M.C.: "I Crossed the river with the first troops over. Soon afterwards General Pole-Carew sent me back with a message to the O.C. Loyal North Lancashire Regiment. After delivering it I returned and found about fifteen wounded in a cattle kraal at Rosmead. Having dressed these I went on after the troops that had advanced towards Frazer's Farm. I found about twelve wounded up there. It was then getting dark; the cease-fire sounded[1] and the troops

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[1] The only time the cease-fire was sounded in the 1st Division during the war.

fell back on Rosmead, I stopped about twenty men; pulled down the doors of some cottages, and on them carried the wounded back to Rosmead, where they were put into a house which General Pole-Carew gave up for that purpose. About twenty-four wounded were collected at this house; all the bedding and female clothing found in it were utilized to cover them, as there were no service blankets and it was an intensely cold night. The dressings in the surgical haversack and field medical companion were sufficient for all requirements. There were no rations available, but all emergency rations were opened and given to the wounded. There was a plentiful supply of onions. A man who had shot a hare during the battle and was carrying it slung from his rifle was brought along with the stretcher party and his hare was made into soup for the wounded. Four unarmed wounded Boers reported themselves to me. I informed the General and subsequently sent them in next day with the other wounded."

Field Medical Units.—On the march from Witkoplaagte the medical units moved in two lines behind the brigades, bearer companies leading and the Divisional Field Hospital behind that of the Guards Brigade. When the battle began they all came more or less under shell fire and had to retreat. The positions of the dressing stations marked on the map, approximately indicate the relative directions of the march of the bearer companies at that time. The Guards Bearer Company, furthest from the railway, fell back a short distance to a depression, in front of the higher ground along which runs the road from Bosman's Drift, and there opened a dressing station. The 9th Brigade Company moved back to the point where a dressing station is shown near the Ganger's Hut. Its position was fixed by the shells fired at the ammunition column. Shells directed at the naval guns fell mostly in the space between those guns and the road in front of them. This prevented the 9th Brigade Bearer Company making any attempt to establish a dressing station in the area immediately behind its brigade and also prevented ambulance wagons moving across the railway line until late in the afternoon. The dressing station of the Guards Bearer Company, although only just over 2,000 yards from the Boer trenches, was protected from rifle fire and, as there was no target for the enemy's guns in its vicinity, it was not disturbed by shells. Both dressing stations were soon at work. Wounded men walked back from the front from the very first and continued to do so all day.

Captain T. B. Beach, with some stretcher squads of the Guards

Bearer Company, went forward towards the position occupied by the 2nd Coldstream Guards and the Grenadier Guards. They came under heavy fire and one of the enemy directed a whole clip of cartridges at a squad under Captain Beach's personal control; however, none of the party were hit. A few ambulance wagons went forward to the same part of the field and were subjected to severe pom-pom fire. At that period of the war the ambulance wagons did not carry distinguishing flags and had only a small red cross painted on the body of the wagon. It is quite likely, even if fire was deliberately aimed at them, that the enemy were unable to recognize the moving vehicles as being ambulance wagons.[1]

Captain C. W. R. Healy, of the 9th Brigade Bearer Company, went forward with stretcher squads on the left, but the conditions there were even more unfavourable than on the right. In the afternoon Captain Beach and Lieutenant Hodgson were sent to the reservoir collecting station with five ambulance wagons. When half-way across the pom-poms fired at something south of the wagons, whereupon the Kaffir drivers lost control of themselves and the mules and the teams stampeded back to the dressing-station. It was then getting dark, and no further attempt was made to remove the wounded at the reservoir, but Captain Beach and Lieutenant Hodgson remained there all night.

After dark the Guards Bearer Company, carrying about twenty-five wounded in the ambulance wagons, moved back to the site of the field hospitals; a wagon, with rations and cooking-pots, and a water-cart were sent to the reservoir.

When the action began Colonel Townsend ordered the Guards Brigade Field Hospital to move up to the vicinity of the Ganger's Hut, but not to open until the action developed. Its actual position, about 1,000 yards south of the Ganger's Hut, was determined by the most convenient place for entraining as far forward on the railway as it was safe to go without risk of being hit by an occasional extra long range shell. This unit worked as a dressing-station during the morning, and did not pitch tents and open as a

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[1] These incidents excited a good deal of attention at the time, but most people will agree with the view expressed in *The Times* "History of the War," vol. ii. p. 361: "Like several of the earlier battles of the war, Modder River was followed by mutual charges of wanton firing upon ambulances and stretcher-bearers. The simple fact is that ambulances on both sides ventured into the fire-swept zone, and had to take the consequences. There is no reason for suggesting that the Boer leaders, any more than ourselves, intended to conduct the struggle otherwise than in the fairest spirit."

hospital until the afternoon. The Divisional Field Hospital opened alongside that of the Guards Brigade.

At Klokfontein Siding, about three miles south of the battlefield, there was a good camping site with facilities for entraining and the general conditions were favourable for a temporary concentration of wounded. Colonel Townsend, therefore, decided to place the Divisional Field Hospital at this point, and to send the wounded back to it by rail. The 9th Brigade Field Hospital when last heard of had not disposed of the wounded at Graspan Siding, and was not expected to be available during the battle. The movements of that unit and course of the above arrangements will be seen by the following record kept by Captain J. C. Jameson :—

"After entraining the wounded at Graspan on the afternoon of November 27, we moved to Enslin Station, and, at 4.30 a.m. on the morning of the 28th, we resumed our march to catch up the Division, the position of which was unknown.

"We outspanned about 7.30 a.m., and, moving on again, we marched to the 'sound of the guns,' and arrived on the battlefield at Modder River about 9 a.m., and halted[1] in rear of the naval guns. "I was then sent to find the P.M.O., to whom I reported the arrival of the hospital.

"Orders had been given to the Divisional Field Hospital to retire to Klokfontein, and open there.

"I was directed by Colonel Townsend to find the Commanding Officer of that unit, give him instructions to remain at Modder River, and then direct the 9th Brigade Field Hospital to return to Klokfontein, and to say that arrangements would be made to transfer wounded to that place by train from Modder River.

"The 9th Brigade Field Hospital accordingly returned some three miles to Klokfontein, and selected a spot to encamp near the railway, and within easy distance of water. The hospital was opened, and the usual preparations made to receive the wounded.

"As time passed and no wounded arrived, I was instructed to report to the P.M.O., and inquire about the arrival of the wounded.

"I returned to Modder River, and found that the train could not be moved, owing to a 'dead engine' from shortage of water.

"I reported the state of affairs to Major Harris in command of the 9th Brigade Field Hospital at Klokfontein.

"As the wounded could not be taken to us, it was obvious that to be of any use we must go to the wounded; so, taking about

[1] About thirteen miles from Enslin.

half the men and the surgical wagon, the officers returned to the battle-field, and arrived there just at dark. There, dividing up into small parties, we did our best to assist the personnel of the Guards Bearer Company and of the Guards and Divisional Field Hospitals, and when all the wounded had been reported as having been dressed, we returned to Klokfontein, and remained there until the following morning."

Wounded were arriving at the site of the field hospitals south of the Ganger's Hut all day. Some walked there, others were carried back from the field or the dressing-stations by stretcher-squads or ambulance wagons. They continued to come in for some time after dark. The dressing-station of the 9th Brigade Bearer Company received wounded, who made their way back at various times throughout the night. There was no general movement of ambulance wagons or stretcher parties after dark. A report reached the Guards Field Hospital about 10 p.m. that a number of Highlanders had not been brought in, and that they wanted help. Surgeon-Lieutenant-Colonel Magill, with some men and an ambulance wagon, under Captain Healey, went out and found them under a culvert near the position occupied by the troops during the day. The work of bringing them to the field hospital was difficult, as it was very dark and no lights were allowed.

Making a rough estimate of the position of the wounded at nightfall, it seems probable that there were about 200 in the two field hospitals, 30 in Rosmead village, 70 at the hut south of Rosmead, 60 at the reservoir, about 20 at the dressing station of the 9th Brigade Bearer Company, and the remainder with their units at various points on the field.

Lord Methuen was in the Guards Brigade Field Hospital, and Colonel Northcott in the Divisional Field Hospital.

November 29.—At dawn the troops that had not already done so began to cross the river by the dam at Rosmead, and later on by the drift to the east of the railway bridge. The 9th Brigade Field Hospital, which was free and ready to move, was sent forward at an early hour from Klokfontein; it followed the troops across the river and remained in readiness for any emergency should the enemy reappear. Four ambulance wagons and a party from the Guards Brigade Bearer Company were told off to stand fast on the south bank of the river until the ground in the vicinity of Modder River station was safely occupied. The further movements of the Division were at the time uncertain, and the imme-

diate object of the P.M.O. was to clear the field units of wounded and set them free to follow the troops.

The 9th Brigade Bearer Company started at daylight to bring in the wounded from Rosmead and "the hut" to the field hospitals, and the Guards Brigade Bearer Company sent ambulance wagons and men to clear the wounded from the reservoir. The Rosmead cases were carried across the river at the dam by parties under the command of Lieutenant Fell, 9th Brigade Bearer Company. This was a very risky and trying procedure, and no doubt many of the wounded would have been much better left where they were and removed later to field hospitals at Modder River Station. But at the moment no one knew that the Division would halt, as it eventually did, for more than a week, and the method adopted for dealing with the seriously wounded was apparently the best open to the medical service in the situation as it existed.

Meanwhile arrangements were made to provide trains to carry the wounded from the field hospitals to Orange River. All the available medical personnel was occupied in preparing the wounded and loading them on the trains. The first train, which ran in two sections, started about 1 p.m. It was made up of trucks, some of which were open and some partly covered. It carried four officers and 335 other ranks, sick and wounded. In the open trucks shelters were made with blankets and rifles; all water-bottles were filled, and milk and beef-tea provided for the journey.

The transfer of the wounded from Rosmead and "the hut" to the site of the field hospitals was not completed until 3 p.m. Many of these were very serious cases which required careful handling. The admirable work done at the hut during the night by Lieutenants Crisp and Jagger greatly lessened the time that otherwise would have been taken in evacuating these cases. By daylight all of them had been splinted and dressed in such a way that practically no re-dressings were necessary before they were placed in the train.

The severe cases from the field hospitals were also kept back for the second train, which was not ready to start until after 4 p.m. This train was made up of covered trucks. It was loaded with thirteen officers and eighty-four other ranks. As practically all of these were very severely wounded they were kept on stretchers, and there was great difficulty in loading the stretchers until a saw was procured and suitable openings cut in the sides of the trucks. Owing to the late start extra blankets were provided for each man. Three patients died on this train before

it reached Orange River about midnight. Particulars of the cases are not known, and it is not clear why they were entrained, as directions were given by the Principal Medical Officer that wounded unable to stand the journey were not to be sent. Two officers and three or four men whose condition was considered dangerous by those responsible for their care were retained by the field hospitals and subsequently brought across the river. With these exceptions the whole of the wounded were evacuated soon after 4 p.m., and by 5 p.m.—less than twenty-four hours after the cessation of fighting—the medical units were on their way to rejoin the troops on the northern bank of the river, having despatched during the course of the day 436 sick and wounded to Orange River. Of the total wounded, 371 were included in that number.[1]

(*To be continued.*)

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[1] See p. 421.

Clinical and other Notes.

NOTES ON CASES OF BILHARZIA HÆMATOBIA COLLECTED AT THE ROYAL HOSPITAL, CHELSEA.

By Lieutenant-Colonel R. J. C. COTTELL.
Royal Army Medical Corps.

The number of men invalided for Bilharzia hæmatobia up to the end of December, 1911, reached 626.

The first cases were invalided in 1888, 2 cases, and there were no others until 1900, 1 case; in 1901, 4 cases; in 1902, 94 cases; in 1903, 273 cases (the maximum). The number of fresh cases then dropped rapidly, being 13 in 1907, and in 1910 and 1911, 5 and 3 cases respectively.

Of the total 626 cases, 267 cannot be any longer traced for the following reasons: 54 were given "permanent" pensions, 45 were given "final" awards, 66 have been struck off the pension list for "absence," 4 for "felony," 3 for "re-enlistment" (these were held to serve, being apparently well), 30 due to "deaths," and after repeated medical examinations, 65 have been struck off the list as apparently recovered.

We have, therefore, 359 cases still being carefully examined every six or twelve months.

It is satisfactory to note that, quite apart from the good outlook, so few fresh cases are being found, and there has been a steady lessening in the total number remaining on the pension list. At the end of 1906 we had 480 on the list; at the end of 1909, 414; 1910, 387, and at the end of 1911, 359. I think we may also take it that the cause of a great many of the cases of absence (66) may be that the men consider that the disease has left them, which usually means they no longer pass blood in their urine, and that the lumbar pain has gone, otherwise most of them would have come up for examination with the view of getting their pensions renewed. All this seems to point to the eventual disappearance of the disease.

With the exception of four, all the 626 cases originated in Africa, and all these, with the exception of the "Nile" case, came from South Africa.

A short statement about the above four cases, and the one from the Nile basin, may be of interest:—

Case 1 was supposed to have contracted the disease from "drinking river water while up the Nile on leave" in 1900. He was never in South Africa, nor had he served in any other foreign station. Ova and blood were first noticed in March, 1901. He was last seen in November, 1905; he was then passing a large number of ova. This case is worth recording

because of the curious fact that he is the only invalid for this disease among all the British troops that have served in the Nile basin during so many years. Sir Patrick Manson mentions in his book "Tropical Diseases," that Dr. Bilharz, who discovered the cause of the "endemic hæmaturia" of Egypt in 1851, considered Bilharzia to be present in one half of the population of that country.

Case 2.—Blood and ova were first found in February, 1904. He had then been in Hongkong only one month, and had come direct from England. He had never been in Africa or India or any other foreign station. He had been a miner near Wolverhampton up to the time of his enlisting in May, 1903. Ova continued to be found in his urine each year up to October, 1907, since when the man cannot be traced.

Case 3.—Ova were first seen at Poona, in February, 1906. He was invalided in April of the same year. He had only been in India three months when the ova were first found. He left India in April, 1906, and was examined in England in September, and the following note was made: "Ova, blood and albumin in the urine. Very anæmic and has effusion into both knee joints." He was again examined in March, 1908, his urine being then apparently normal. He had never been in Africa or any foreign station, except for the three months in India. Unfortunately this man too cannot be traced.

Case 4.—Ova first found in August, 1903, at Mian Mir. He had never been in Africa, but had served between 1899 and 1903 in India, at Chakrata, Peshawar, and Deolali, besides Mian Mir. He was last examined in June, 1911, on which occasion, and for the previous five years, no ova or blood could be detected. In 1904 it was noted that he had "well-marked malarial cachexia."

Case 5.—Ova and blood were said to have been found at Norwich in January, 1905. He was invalided in February, and in May he was re-examined, and no ova were found. He enlisted in Norwich in December, 1903, and was never out of England. Since May, 1905, nothing has been heard of him.

Cases 2 and 3 could hardly have contracted the disease at their stations—Hongkong and Poona respectively—could they not have contracted it on the voyage, either at a port or perhaps, but improbably, on their ships?

I fancy Cases 4 and 5 were possibly wrongly diagnosed.

The two earliest cases of invaliding (the 1888 cases) were first seen in 1886. One occurred in Natal and the other in Zululand. The Natal case was last seen in 1890, when he was still suffering from the disease. The second case was last seen in 1908 and was then passing ova.

It is interesting to note the causes of death as far as they have been reported to us, and as this list is defective I think it best to give it in full:—

	Date of invaliding		Date of death		Cause of death
1.	1902	..	7.2.10	..	"Consumption," "Phthisis Pulmonalis."
2.	,,	..	20.2.10	..	"Anæmia and Cardiac Distress."
3.	,,	..	3.5.11	..	"Laryngitis" "accelerated by chronic lead poisoning."
4.	1903	..	27.6.03	..	Not known. (Last note 22.12.02, "Severe cystitis, blood and pus in urine.")
5.	,,	..	7.10.03	..	Not known. (Last note 11.4.03, "Cystitis; blood and pus and ova in urine.")
6.	,,	..	27.12.04	..	"Cerebral Gumma," "Meningeal Hæmorrhage."
7.	,,	..	1.8.05	..	"Pneumonia" ("Anæmia, pain in back and bladder.")
8.	,,	..	7.10.06	..	Not known. (Last note 12.12.06, "Great debility, blood and albumin in urine.")
9.	,,	..	14.12.06	..	"Fibroid Phthisis."
10.	,,	..	2.11.07	..	"Acute Obstruction of the Intestines."
11.	,,	..	31.12.07	..	"Diphtheria."
12.	,,	..	18.4.08	..	"Dementia," "G.P.I." (died in Asylum).
13.	,,	..	20.12.08	..	"Pulmonary Phthisis," "Anæmia and Debility."
14.	,,	..	16.10.10	..	"Phthisis Pulmonalis."
15.	,,	..	1.6.10	..	"Tuberculosis (General)," "Spinal Caries," "Abscess of Lungs."
16.	,,	..	6.5.11	..	"Phthisis."
17.	1904	..	18.4.04	..	"Acute Gastritis," "Hæmatemesis," "Syncope," "Cystitis."
18.	,,	..	4.5.04	..	Not known. (Last note, 11.1.04, "Weak and Anæmic.")
19.	,,	..	19.12.04	..	"Pneumonia," "Cardiac Failure."
20.	,,	..	27.2.07	..	Not known. (Last note, 28.12.06, "Ova and blood present.")
21.	,,	..	9.5.09	..	"Drowned," accidentally.
22.	,,	..	19.7.10	..	"Inflammation of veins of eyes and brain."
23.	,,	..	23.6.11	..	"Pulmonary Phthisis."
24.	1905	..	30.3.06	..	"Syncope" "following anæmia and exhaustion, due to Bilharzia Hæmatobia."
25.	,,	..	18.2.08	..	Not known. (Last note 17.1.07, "Ova, very debilitated; hæmorrhage from rectum.")
26.	,,	..	29.3.08	..	"Heart Failure."
27.	1906	..	22.3.07	..	"Nephritis."
28.	,,	..	9.4.07	..	(*a*) "Carcinoma of Bladder" (*b*) "Syncope."
29.	,,	..	4.2.09	..	"Uræmic Convulsions," "Bright's Disease."
30.	1907	..	15.2.10	..	"Abscess," "Cerebral Compression."

From the character of the diseases generally that have been the certified causes of death, there seems little doubt that Bilharzia has in most cases been a great factor in producing the debility and anæmia that was the possible precursor of the fatal illness.

I have "six-monthly" or "annual" notes on almost all the cases, and I have been struck by the debility and low standard of health that is really present in the majority of them. To all appearance these men may

look quite healthy, indeed it is often stated that they appear "robust," though at the time they may be passing a fair amount of blood and ova in the urine. However, they almost all complain of lumbar pain, which is increased on stooping, and which frequently prevents them doing ordinary labouring work. Their appearance, therefore, characterized often as "healthy-looking," "stout," "robust," has to be very much discounted as otherwise we may sum up their present condition very unfairly.

Up to the present we have been baffled in our attempts to cure this disease and though evidence of cure by time is shown in the statistics that I have been able to collect at Chelsea, still this is a slow process and not creditable to us as doctors. As to the question of "cure," up to now we can only say "we hope so."

Cases have been in hospital for months under careful observation and treatment, but so far, in spite of all we could do, we have had no success. We have, however, lately made great advances in the treatment of many other diseases, and are we to be beaten by this comparatively large inhabitant of the blood-vessels? Could we not do more than we are doing in the countries where this disease is so common? We should probably have a better chance abroad, though at the same time we must not neglect those cases we are paying so heavily for at home, and who may be spreading the disease in our own country, though fortunately we we have no evidence of it.

The cost to the State per annum of those men still remaining on the "conditional" pension list on account of this disease—that is of 359 cases—is about £6,400. An additional sum of £1,400 per annum has already been allotted as "permanent" pensions.

Note.—Since writing the above, four fresh cases of invaliding for Bilharzia have come to hand (March 7th, 1912). Two of the cases apparently originated at Rosehill, in Mauritius, in January, 1911. The disease is common in Mauritius, though up to the present we have had no soldiers invalided from there. Both these men had served in South Africa for more than two years immediately before going to Mauritius, though in their cases the history strongly points to the disease originating in Mauritius. The other two cases come from Egypt. The first case has twenty-one years' service, and according to his statement he has been passing blood in his urine since September, 1898. He first noticed blood when in Alexandria, having just returned from Omdurman. He served in Egypt from December, 1894, to December, 1898. He is now 39 years of age; complains of incontinence of urine, and is passing ova in large quantities, also blood and albumin. The second case noticed blood in his urine in Cairo in October, 1911. He had served in Egypt since February of that year. He is now passing a large number of ova and much blood in his urine.

The first case from Egypt is perhaps an answer to my statement concerning the only case up to the time of writing the above notes that we

have had of the disease originating in the Nile basin. It suggests the possibility that many cases may have occurred, but because of the trivial nature of their symptoms, they have either not noticed their condition or not thought it worth troubling about.

I think Lieutenant-Colonel Simpson's remarks and his quotations from Major Smith's report on this disease, on pp. 664-7 of the December number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1910, should be re-read with these few notes of mine.

QUININE AS A MALARIAL PROPHYLACTIC AND CURATIVE.

By MAJOR N. FAICHNIE.
Royal Army Medical Corps.

IN a recent article ("Quinine as a Malarial Prophylactic; a Criticism," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, November, 1911) Captain P. S. Lelean questions the use of quinine as a prophylactic against malaria. I think most medical officers in India must be very disappointed with the results of the use of quinine for this purpose. In many of the most malarious stations quinine has been used for several years, yet the disease still continues with unabated force, especially in bad years such as 1908. I was always very sceptical myself of quinine as a prophylactic, but was partly converted when I read Ross's book on "Malaria," where the results of this practice in Italy are given. When the number of deaths from malaria, checked by European doctors, falls from nearly 16,000 in 1900 to 3,000 in 1908, and there is a corresponding fall in the admissions both amongst the civil and military population, brought about entirely by the use of quinine, one cannot help thinking there must be something in it.

Possibly, the reason for the success in Italy compared with that in India is in their method of administering the drug. In India it is difficult to get the troops to parade every day, so generally quinine is given twice a week; also the insoluble sulphate is the salt usually administered, while in Italy soluble salts like the bisulphate are given in doses of 6½ to 10 gr. every day according to the prevalence of malaria in the locality.

It is generally considered that parasites are most easily killed by quinine in their early stages, so the Italian method of dosage should be the better, especially if the quinine is given just before dusk in order that it may be present in the blood at the most likely time of infection. The daily use of quinine is also the method recommended by Ross, and I think it well worthy of a more extended trial in India.

In conjunction with this subject the long continued use of quinine as a curative of malaria is worth consideration. There is no doubt that quinine is a specific for malaria while an attack is in progress, but whether

it should be continued for long periods after the fever is over is another question. Personally, I had an attack of benign tertian more than a year ago; I only took quinine for a week after the fever left me, but I have had no recurrence. Similarly, I had an attack of malignant tertian this year and only took quinine for a similar period, with no recurrence up to the present. Ross recommends a "rigorous quinine treatment for four months," but the Italians, on the other hand, insist that quinine does not have much effect on relapses; Caccini especially, who has studied the question very carefully, holds this belief. One instance he gives is worth quoting. A band of seventy-five Calabrian workmen had become infected in July, 1900, and subsequently took quinine until December, a period of about five months. Fourteen months after the first infection sixty-two of these men were exposed to a very severe wetting with rain, while the remaining thirteen found shelter. Within a week every one of these sixty-two men was attacked with fever, but those who had not been exposed escaped. What was the use of a continued course of quinine with all its discomforts in these cases? It seems that after an attack of malaria some great depression in vitality is sufficient to produce a relapse, even if much quinine has been taken.

This accounts for the great number of enteric patients who at the beginning of their illness combine with it an attack of malaria. In the case of an officer who had not had an attack of malaria for fifteen years I found malignant tertian rings in the blood during his first week of illness from paratyphoid fever.

I think that in India we might easily get a solution to the question of whether a long course of quinine is necessary by watching malarial convalescents in those Himalayan hill stations that are above the malarial zone.

When Ross was experimenting with birds he found it was sufficient to move them to a cool place for their parasites to diminish in number. A year or two ago a statement was published describing how the malarial convalescents at Kasauli were treated, and reporting the excellent results that were obtained by the continued use of quinine, but unfortunately no control was given of malarial convalescents who took no quinine. I would suggest that half the malarial convalescents at Himalayan stations be treated with quinine and half without any at all, except, of course, for actual attacks. We should soon get some results which would show the true value of long-continued courses of quinine after attacks of malarial fever.

FIELD COOKING.

By Lieutenant-Colonel H. E. R. JAMES, C.B.
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This is a subject of special importance to the medical officer since much of the disease of armies in the field is predisposed to by faulty food and monotony of diet, and, moreover, waste of good material is certainly caused by the inability to make it appetising, and an important part of the care of the sick and wounded is the cooking of food suited to their needs.

In the "Manual of Military Cooking," pp. 59 to 71, and Schedule VI., pp. 80 to 82, the subject is dealt with under the headings:—

Field Instruction.—Cooking in mess tins, preserved meat tins, Aldershot oven, erecting the oven, directions for working, kitchen, wood.

Recipes for Field Cooking (fourteen given).—The instructions are chiefly, as a matter of course, directed to cooking of food in bulk by company cooks, which is a necessity of the situation; for it is a saving of fighting energy and time for the men to have their food prepared for them by a small percentage of their number who are not in the firing line.

But, on the other hand, men are likely to be separated from the main body in groups or small detachments, and in this case the regimental cooks are inaccessible, and the men must either subsist upon previously cooked (hence cold) rations, raw rations, or the emergency ration; or else they must be prepared to cook their raw rations in their mess tins.

In the "Manual of Military Cooking," pp. 36 and 37, five dishes are mentioned as suitable for preparation in mess tins: Plain stew, Irish stew, curried stew, sea pies, meat puddings.

Very brief directions are given with regard to them, and the time taken to cook is three hours, whence it will be seen that cooking by individuals in mess-tins is not seriously contemplated, and the British soldier is consequently not well equipped in the matter of preparing his own food.

Cases have occurred on active service where freshly-killed meat and raw flour have been issued as rations, and each man has had to make what he could of his ration without the help of the cook and without a very clear notion of how to proceed. The natural impulse, generally followed, was to put the flour and meat into the mess-tin, fill it up with water, and boil it, the result being a substance like rubber and some dirty water.

It is said by the school which deprecates formulation of ideas, and holds that everything will come right after a little practice in campaign, that the soldier, in the light of experience gained by failure, will soon learn to cook for himself, and that he needs no instruction beforehand. But, in the meantime, he suffers from indigestion and starvation, and if

a little instruction and practice, even at the expense of the lustre of the mess-tin, were afforded in time of peace, the knowledge gained would be of practical utility to the man, whether as a soldier or in after-life as a civilian, and would make him more independent than he is at present, and hence the State would benefit.

In the French Army, and doubtless in some others, the art of individual cooking is given a place of some importance, and a most excellent book has been published in French called, "Livre de Cuisine Militaire aux Manœuvres et en Campagne," published as a military handbook by Henri Charles-Lavauzelle, St. Germain, Paris.

Very complete directions for field cooking, using the rations and apparatus available on service, and much necessary information bearing upon the subject, together with recipes for thirty-one dishes, are given in this manual, and most of these dishes would be as palatable to the British as to the French soldier. The Frenchman is proverbially good at cookery, and this manual will, I am sure, repay a careful study. I propose to make its contents the foundation of this article.

In a recent article in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xvii, page 497, Lieutenant Kinsella, R.A.M.C., has given a short account of field cookery as practised in the Training Camp, Royal Army Medical Corps, at Tidworth, which included certain of the recipes from the "French Manual." The subject seems to me so well worthy of attention that I think a more extended consideration is desirable, and it might even be possible to issue a pamphlet to the troops containing recipes for use at their camps of exercise or company training, and make them cook their own food on, say, one day a week.

In the French Army co-operation by four men is usual, and certain utensils for collective use, which we do not possess, are supplied, e.g., a *marmite*, which is of a capacity of four mess-tins; a *gamelle à quatre hommes* is carried by one of the four, in addition to his own mess-tin or *gamelle individuel*. The *marmite* is a metal vessel for boiling and stewing, with a lid which can be used for frying. It holds 5 litres, as does also the large *gamelle*.

The *marmite* is a tall vessel with a lid which is of the capacity of a single *gamelle*. A socket projects from one side of the lid to receive a handle for frying purposes. The *marmite* and lid are kidney-shaped in horizontal section, rectangular in elevation. The lid has a loop handle which folds down over its convex posterior aspect. The height of it is 10½ in. without the lid. Its extreme width is 9 in.

The *gamelle à quatre hommes* is basin-shaped. Its exact use is not specified, but it would be very convenient for washing vegetables or mixing ingredients, and in a variety of ways.

A coffee mill is carried by a "half section" on manœuvres and active service.

In the British Army, mess-tins only are carried by the men; the camp

kettle which might replace the *marmite*, but which is of twice its capacity, is not suited in shape for carrying on the person. Its lid can be used for frying.

The French individual *gamelle* is a simple round pot wider at the top than at the bottom, with a lid attached to it by a chain. It does not seem suitable for handling over a fire. Our mess-tins, on the other hand, are provided with handles, and can be used for boiling, and their lids for frying.

Given the use of a camp kettle the instructions for the preparation of the dishes contained in this manual for the French squad, with their four *gamelles* and *marmite*, could be quite well carried out by a British squad of eight with their eight mess-tins and camp kettle.

The French soldier has the following meals on the field :—

(1) *The morning repast* of coffee and bread, and if possible soup, cooked overnight and warmed up in the morning, or kept hot through the night.

(2) *The midday meal*, taken at the *grande halte* or in camp.

(3) *The evening meal*, which is the most substantial.

The next day's midday meal will be drawn from this in part.

(4) Also, when the evening meal can only be served at a late hour, a *collation*, composed as far as circumstances permit, of cold food or food rapidly prepared. Since much of the preparation must be done at the end of the day's work, pains must be taken to keep the men alive to the necessity of doing it properly, as they will be tired and apt to scamp it.

General directions for the preparation of rations for cooking are given, and useful hints bearing on the subject, e.g. :—

Meat freshly killed should only be boiled or braised, and it must be cut up into small pieces after having been boned. Meat which has been lightly salted may be used for soup, ragoût or roast. Before using it, it must be brushed and scraped with a knife so as to get the salt out of the crevices. It must be carefully washed and rinsed. Soups and other dishes made out of salted meats must not have salt added to them. Meat which has been cooked overnight must not be carried in mess-tins, especially in hot weather. It should be made into sandwiches carried in the haversack. Bones should be broken up and made into soup overnight.

Vegetables.—The water for boiling vegetables *must* be soft. If it is hard it must be softened by the addition of soda. When the white cloud caused by this has settled the water can be poured off, leaving the sediment.

Alimentary pastes—e.g., macaroni, tapioca—must not be boiled for long.

Lard and Saindoux.—Saindoux is clarified lard. These fats are used for cooking. Saindoux has a lower melting point than unclarified lard. Fat is essential to cooking and some must be carried by each man ; a tin box is useful for this. Men are also enjoined to carry two or three onions each (another almost universal ingredient).

The Kitchens.—Hearths made of bricks, stones, or small trenches are recommended.

To light the fire in rain.—The fire may be started inside a cooking pot and when the material is thoroughly alight continued in the proper place.

Utensils must be *washed* immediately after use. Sand is not to be used as it takes off the tinning. Paper, rags, grass, or straw pads are good.

A table is given showing the weights of food materials corresponding to spoonfuls, tumblerfuls, and mess-tinfuls for rapid measurement.

Thirty-one recipes follow. The Frenchman is very fond of soup, and fourteen recipes are given for soups.

The directions for the cooking of each dish are classified into:—

(1) *Preliminaries* such as *boning the meat*, which is one man's work.

Getting ready the fire, another man's duty.

Washing and cutting up the vegetables, a third man's task.

Chopping up the bread and *distributing* it among the mess-tins.

(2) *Method.*—An exact description of the cooking.

(3) *Observations.*—Any special directions.

Next follow seven ways of cooking fresh and preserved meat, remarks on mutton and horseflesh.

Then nine recipes for the cooking of vegetables and flour, including unleavened bread.

Finally, the preparation of coffee or tea and a method of keeping food hot which has been cooked overnight.

A few recipes from this book, viz.: *Soupe à la minute*, potatoes *à la paysanne*, *quenelles* of flour, *pilaff de bœuf*, were quoted in Mr. Kinsella's paper, and there are one or two others which will be found very useful and worth quoting at length.

SOUP OF PRESERVED MEAT.

Time—One hour and a-half.

For four men.

Preserved beef	Four half rations.
Saindoux or lard	Two spoonfuls.
Carrots in quarters	Three-quarters of a mess-tinful.
Onions chopped up	One-third of a mess-tinful.
Cabbage chopped up	Four-mess-tinfuls.
Salt	One heaped spoonful.
Water	Three mess-tinfuls.
Chopped bread	One mess-tinful.

Preliminaries.—Make the fire. Cut up the lard. Clean the carrots, wash and chop into quarters. Clean the cabbage, wash and cut into eight pieces. Take the meat out of its tin. Chop the bread into small pieces.

Method.—Put the lard into the *marmite*, melt over a quick fire. Add the carrots and onions. Brown lightly, keeping constantly moving over a brisk fire. Moisten with water and boil. Add two-thirds of the salt.

Keep boiling moderately for thirty-five minutes. Add the preserved meat and warm for ten minutes.

To serve.—Put the meat and two-thirds of the vegetables into the lid of the *marmite*, and pour the soup upon the chopped-up bread in the mess-tins.

Observations.—In case, as is possible, the soup after the removal of the meat should be insufficient, other water should be kept boiling and added to it after the removal of the meat.

The following is an ingenious way of preparing wheat previously unground, which amounts to porridge.

POTAGE VAUBAN.

Time—30 minutes.

Materials for four men.

Wheat	Half a quarter litre = about a quarter of a pint.
Saindoux	Two spoonfuls.
Salt	One spoonful.
Water	Three mess-tinfuls.

Preliminaries.—Prepare the fire. Grill the wheat lightly (not to char it), and keep it moving. Break it up, unless there is some means of grinding it, such as a coffee-mill.

Method.—Soak the wheat in cold water. Incorporate the water with it gradually to avoid lumps. Put the mixture on a small fire to boil, stirring constantly with a piece of wood. Cook for fifteen minutes. Add the salt and the saindoux and divide among the mess-tins.

UNLEAVENED BREAD.

Time—30 minutes.

Materials for four men.

Flour	Twenty heaped spoonfuls.
Salt	Two-thirds spoonful.
Water	One quarter litre (about half a pint).
Saindoux (if possible)	Half spoonful.

Preliminaries.—Dissolve the salt in the water. Mix in the flour, incorporating it little by little with the salt water to obtain a firm dough. Divide the mass into two, and roll out each portion, using a tool handle or empty bottle. Shape each portion into a loaf of the size of the bottom of the large *gamelle* (the lid of a camp kettle would do). Pass the point of a knife round between the dough and the tin to prevent it sticking.

Method.—Grease lightly the bottom of the *gamelle* (to keep it from sticking to the dough). Put it upon the fire, and allow it to cook over a moderate fire for ten minutes. Turn the loaf over and take it off when cooked (five minutes). Repeat this with the other loaf. These chupatties may be eaten as bread.

Rapid Cooking of Meat.—Time eight minutes. The ordinary methods

of preparing meat necessitate somewhat long cooking. If time presses the meat can be *sauté* as follows:—

Cut the meat into very small pieces. Beat it with the back of the chopper. Add salt and pepper and fry it quickly in smoking saindoux.

NOTES ON A CASE OF MUSCARINE POISONING, COMPLICATED BY MALARIA.

By Major H. E. Winter.
Royal Army Medical Corps.

Sapper C. W., Royal Engineers, was admitted into the Military Hospital, Gravesend, at mid-day on October 25, 1911, in an extremely prostrate condition; he was drowsy and could only be aroused with difficulty, both pupils were dilated and fixed, pulse 130, feeble and flickering; the respirations were laboured, his temperature was 102° F., the extremities were cold, the face cyanosed and tongue furred, dry and brown. He was immediately put to bed and hot-water bottles were applied to his extremities, brandy in warm water was given internally, also a hypodermic injection of atropine. Two hours after admission he was feeling quite comfortable, the extremities were warm, his pulse was less frequent and of better volume, but he complained of intense thirst. The following history was elicited from him:—

On October 18, he gathered about 2 lb. of mushrooms from the rifle range near Shornmead, cooked and ate them all. He felt no ill-effects next day, but on the 20th and 21st he suffered from dizziness and headache. Notwithstanding this, he ate some more mushrooms, and on the 22nd he was feeling worse and took some pills. On the 23rd he felt somewhat better, but next day he felt very ill, complaining of headache and colic, and took a seidlitz powder which moved him freely, but the giddiness, headache and colic persisted and he was sent to hospital on 25th.

Previous History.—He served in Malta from September 28, 1908, to September 28, 1910, and was then sent to England and posted to Chatham, where he was stationed until July 12, 1911, when he was transferred to Fort Shornmead ($4\frac{1}{2}$ miles distant from Gravesend) for duty as permanent marker at the rifle range. He was quite fit all the time he was in Malta and also during his home service, the present illness being his first admission.

Progress of Case.—On the evening of October 25 he was feeling quite comfortable, pulse 110, pupils still widely dilated. He vomited some curdled milk on the morning of the 26th, but no marked change occurred in his condition on this date. On the 27th there was a return of his symptoms, and during the night he had a rigor followed by a feeling of distension of the abdomen. At the evening visit there was

considerable improvement, temperature 99·6° F., pulse 80, no pain nor discomfort. He was free from all symptoms on the 28th, temperature normal all day but pulse remarkably slow, 68 beats to the minute. On the 29th, there was a return of the symptoms following a very bad night. At 5 a.m. he complained of severe colic and his condition was very serious, pulse 130, weak and irregular. At 11.15 a.m. he suddenly collapsed and became unconscious, pulse imperceptible at the wrist, respirations very shallow and infrequent, extremities cold. Oxygen was immediately administered and hypodermic injections of ether and liquor strychnine were given, præcordial massage being also employed. After persisting in the treatment for some considerable time, he came round and his condition became more favourable. At the evening visit his pulse was 80 and temperature 99° F.; later on the pulse dropped to 68 and temperature to 98·6.° He was free from all symptoms on the 30th, and slept during the night up to 3.30 a.m., on the 31st, when he awoke and complained of feeling cold. Between 4 and 5 a.m. he became cyanosed and his temperature rose to 101·4° F. The symptoms again subsided and he was quite comfortable all day, on November 1, but at 12 midnight he had a rigor followed by an attack of fever. The periodic return of symptoms pointed so strongly to malaria that I examined a film of blood taken from his finger and found the specimen swarming with benign tertian parasites, as many as ten to twenty being present in every field of the microscope under the $\frac{1}{12}$th lens. Quinine was at once pushed; he has since had no return of the symptoms, and was discharged from hospital on November 16, his peripheral blood being free from parasites.

Points of Interest.—(1) The complication of malarial fever occurring in a man who had been in England for more than a year since his return from a tour of service in Malta and who had not previously suffered from fever, makes it highly improbable that he contracted the malaria in Malta and points strongly to his having been infected at Shornmead Fort, the latter place being situated on the south bank of the Thames, and in a marshy district where mosquitoes are numerous during the summer months.

(2) Dilatation of the pupils. In muscarine poisoning the pupils and the muscular coat of the intestine are usually contracted, whereas in fly fungus poisoning the pupils are often dilated, so that it is quite possible he may have eaten one or more poisonous fungi mixed up with the mushrooms.

(3) The late appearance of the slowing of the pulse.

The toxic effect of muscarine is very erratic and may be due to:—

(1) Amanitin (inert) decomposed into neurin (poisonous); (2) albumen and fatty matter decomposed if the mushroom grows old or is kept long before cooking; (3) drinking the juice that mushrooms have been boiled in.

Translation.

THE AUSTRO-HUNGARIAN REGULATIONS REGARDING THE SURGICAL WORK WHICH IS PERMITTED ON THE BATTLEFIELD.[1]

By Colonel W. G. MACPHERSON, C.M.G., K.H.P.

Introduction.

These regulations establish a new principle in connection with the medical services in war. The object is to train medical officers in *uniform* methods of dealing with wounds at the stages through which wounded must pass in course of removal to units where they may be more continuously treated. The principle is of much importance from two points of view. It gives the wounded man a better chance of recovery than if he were handled by the various medical officers, through whose hands he passes, according to their own individual views; and it economizes the amount and nature of the material required in the field medical units.

During the Russo-Japanese War the advantage of uniform training, such as the new Austro-Hungarian regulations provide, was very marked. The regular army medical officers had apparently received instructions and training in this direction, but the reserve officers were not equally alive to the necessity of sinking individualism in their work.

The principle is specially important in connexion with British Medical Services in consequence of the variety of schools through which medical officers qualify in medicine and surgery, and the resulting variety of individual views as to treatment. It is also a principle which ought to be specially realized and learnt by medical officers of the Territorial Forces who have not the advantages of training under the professor of military surgery at the Royal Army Medical College.

A full translation of the Austro-Hungarian regulations is consequently submitted in order to indicate the nature of the surgical restrictions imposed on medical officers at dressing stations and in field hospitals. It may be noted that the contents of the regulations have been carefully considered by the professors of surgery in the Medical Faculty of the University of Vienna, and are the outcome of collaboration between them, the professors of military surgery at the Army Medical School, and the Directorate of Army Medical Services at the Austro-Hungarian War Office.

Permission to translate the pamphlet has kindly been given by the Austro-Hungarian War Minister.

[1] "Anleitung für die kriegschirurgische Tätigkeit auf dem Schlachtfelde."

Guide to Military Surgery on the Battlefield.

Contents.

Scheme of Work.

Gunshot wounds of the soft tissues.
,, ,, ,, blood-vessels.
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,, ,, ,, femur.
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,, ,, ,, ankle.
,, ,, ,, foot.
Lodged bullets.
Wounds with sidearms.

I.—General Principles.

(1) Wounds are caused by the following weapons in use in war :—

(*a*) Small-calibre bullets with hard mantles.

(*b*) Shrapnel, fragments of exploded shells (including hand grenades), and unexploded artillery projectiles.

(*c*) Sidearms (lacerated, punctured, and incised wounds).

(2) The wounds caused by the hard-mantled small-calibre bullet at medium and long range are generally favourable, partly on account of the favourable anatomical character of the wound—namely, small aperture of entrance and exit, and narrow track—and partly on account of the originally aseptic nature of the wound.

(3) Wounds caused by shrapnel are more serious. Shrapnel bullets, on account of their smaller power of penetration and greater tendency to become deformed, make shallower but wider wounds, and frequently lodge. They cause more extensive wounds of the soft tissues, more serious injury to bone, and often carry pieces of clothing into the wound, thus setting up septic processes.

The wounds caused by irregular fragments of explosive shells almost invariably become septic.

Wounds by unexploded artillery projectiles almost always cause immediate death, except when the extremities are hit. In the latter case either the extremity itself or large portions of it are carried away, so that the wounds are very severe and dangerous.

(4) The wounds caused by sidearms play a minor part in war, and from the practical point of view are generally to be regarded as infected.

(5) The subsequent fate of each wound depends, apart from its severity as determined by the importance of the part of the body hit, also on such circumstance as whether it is primarily infected or not and whether it can be protected from secondary infection.

(6) The danger of wound infection is in proportion to the extent of the injury to the soft parts.

(7) The surgical experiences of the most recent wars have proved the necessity of following systematic lines in the primary treatment of wounds in the field. Under the unfavourable nature of the external conditions individualism in treatment must give way to system.

(8) The demands of material for war have so greatly increased that economical use of medical and surgical material must be rigidly enforced as the duty of everyone. For this purpose it is essential that the nature and amount of material at disposal should be known beforehand.

(9) The principal materials for dressings in the field are the first field dressings and the prepared packages of dressings ("type" dressings).

(10) The contents of the first field dressing of the Austrian Red Cross Society consists of 600 sq. cm. of Vioform gauze, 5 grm. absorbent cotton wool, 400 sq. cm. absorbent gauze, 1 calico bandage 4 m. long by 6·5 cm. broad, and one safety pin. The Vioform gauze, the absorbent wool, and the absorbent gauze are laid one over the other in two equal-sized compresses, with the cotton wool as the middle layer. Each compress is 15 cm. long and 6 cm. wide, and the free ends of the three layers are stitched round to prevent them becoming undone. In addition, one of the compresses is stitched on to the bandage at a distance of about 20 cm. from one end and so rolled in the bandage that it need not be touched. The second compress is not sewn to the bandage, but is so folded that only the outer layer of gauze which is not intended for immediate contact with the wound need be touched.

The first field dressing of the Hungarian Red Cross Society, the regulation first field dressing, and the new first field dressings of the Austrian Red Cross Society differ from the one mentioned above in that the layer of gauze intended to be placed over the wound is not impregnated with Vioform.

All first field dressings are sterilized.

(11) The prepared dressings ("type" dressings) are of three sizes.

The small type consists of 300 sq. cm. absorbent gauze, 5 grm. absorbent wool, one calico bandage 5 m. by 5 cm. and two safety pins.[1]

The medium type consists of 1,200 sq. cm. absorbent gauze, 20 grm. absorbent cotton wool, one calico bandage 5 m. by 10 cm. and two safety pins.

[1] The new pattern contains more gauze, but no absorbent wool and only one safety pin.

The large type consists of 2,400 sq. cm. absorbent gauze, 40 grm. absorbent cotton wool, one calico bandage 5 m. by 10 cm. and two safety pins.[1]

All types of dressings are sterilized.

(12) The surgical work of the front zone is carried out at the first-aid posts, the dressing stations and the field hospitals.

II.—Work at First-Aid Posts.

(13) At aid posts wounded are, according to the degree and nature of the injury, to be made fit either for rejoining the ranks or for further transport to the rear.

The surgical work at a first-aid post consists entirely in applying dressings which are either permanent or temporary. In the latter case the dressings are intended solely for the purpose of protecting the wound until it can be more permanently dressed at the dressing station.

(14) *Permanent dressings* are to be applied when there are small wounds of entrance and exit, whether the wound is of the soft parts only or of deeper structures.

The exceptions to this rule are:—

(*a*) Wounds of the skull,

(*b*) Cases in which operative interference is necessary at the dressing station. (See Section III.)

This first dressing often decides the fate of the wounded.

Cleansing, syringing, probing, manipulating, or plugging wounds, as also removing blood-clot and splinters of bone are strictly prohibited.

The wounds of entrance and exit are simply to be covered with a dressing in such a way that, taking into consideration the permanent character of the dressing, it will remain fixed in position.

The fixing of the dressing will generally be secured by applying a starch gauze bandage; in wounds of the face, thorax and abdomen, by strips of adhesive plaster applied crosswise.

(15) *Temporary dressings* are indicated in all other classes of wounds. Here, too, however, all manipulation of the wound is forbidden.

(16) All dressings must, if possible, be applied with the hands disinfected. In this connexion it must be remembered that a dry unwashed hand is less harmful than a wet hand which is not properly cleansed. When thorough disinfection of the hands is impossible, it is recommended that the dressings be applied by means of sterilized instruments, such as pincers or forceps, or that sterilized rubber gloves should be used.

(17) First field dressings applied on the field by the wounded man himself or his comrade are only to be changed at the first-aid post if they are evidently badly applied or soaked through with blood.

(18) Fractures of bones of the extremities are to be made fit for trans-

[1] The new pattern types contain more gauze and no wool, and the medium type has only one safety pin.

port to the dressing station with the means at disposal, or by improvised material, but immobilization of the limb is to be of a temporary nature only.

(19) Operative interference at a first-aid post is only to be undertaken for the purpose of saving life. The cases of this nature which are mainly to be considered are *tracheotomy* when there is immediate danger of suffocation and *ligature of arteries.* The latter, however, is to be undertaken only when there is dangerous primary hæmorrhage (which very rarely occurs), and temporary stopping of hæmorrhage and further transport to the dressing station are impossible.

When operative interference of the above nature is carried out the hands of the operator and the area of operation are to be disinfected as thoroughly as possible. For this purpose articles are provided (nail-brushes, soap, nail-scissors, disinfecting solutions) in the first-aid post equipment.

Regarding traumatic aneurism, see Section III., Table I., remarks against consecutive number 2.

(20) The material for dressing wounds at the first-aid post is the first field dressing of the wounded, the material contained in the pouches of the medical officers and medical officers' assistants, in the dressings and surgeons' "requisites," knapsacks (or saddlebags in case of cavalry, &c.), and in the aid post wagons (in mountain warfare in the pack transport panniers).

III.—Work in the Dressing Station and Field Hospital.

(21) The dressing station is an improvised operation and bandaging room, equipped for work in the field, where by professional treatment the severely wounded are made fit for further transport.

A reception section and a surgical section are formed at the dressing station, the latter being divided for its principal work into a bandaging section and an operation section.

In accordance with modern principles of conservative treatment, which is the general and correct practice now, the dressing station is a place where only absolutely urgent operations, which cannot be postponed, may be performed.

What must be constantly kept in mind is that the main object of the dressing station is to apply dressings to *all* the wounded, without consideration for individual cases. The greater the number of wounded coming in to the dressing station the shorter must be the time which can be devoted to the individual case.

(22) The field hospital is intended to provide for the wounded the earliest surgical care and hospital nursing.

(23) Both in the dressing station and field hospital the object aimed at must be to maintain asepsis. In spite of the difficulties arising from the conditions that obtain during field operations, and although the

customary appliances in use in peace are lacking, this can usually be attained.

(24) The rules for preliminary surgical work at the dressing station and in the field hospital are laid down in the following tables.

Specially unfavourable conditions, caused by external circumstances, may make it imperative to limit the surgical work at the dressing station, and hand over a part of its work to the field hospital.

The tables also contain directions for the transport and evacuation of the wounded, which are to be followed as far as possible, and to be taken into consideration when filling in the specification tables.

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
1	Gun-shot wounds of soft tissues.	*At the Dressing Stations.* (1) Small apertures of entrance and exit to be treated simply with a protective dressing. Cleansing, irrigating, probing, handling with the fingers, plugging the wound, removal of blood or blood-clots are prohibited. The dressings are to be firmly fixed (with starch gauze bandages, or with adhesive plaster in cross strips in the case of wounds of the face, thorax, and abdomen). (2) Extensive wounds of the soft parts, and contaminated wounds caused by fragments of shell, &c., are to be cleared of fragments and other débris, as follows:— (*a*) Thorough cleansing of the neighbouring parts, the wound itself being carefully protected before solutions are applied. (*b*) Complete stoppage of hæmorrhage; mechanical cleansing of the wound by removal of shattered tissues by means of scissors and forceps, removal of foreign bodies (splinters of wood, earth, &c.), and conversion into conditions of a simple wound. (*c*) Drainage. (*d*) Protective dressing.	—	Dressings applied to small wounds of entrance and exit on the field or in the first-aid posts are only to be removed if they are apparently badly applied or soaked through with blood. In very badly contaminated wounds a prophylactic injection of antitoxin for prevention of tetanus will be administered at the dressing stations.
2	Gun-shot wounds of blood-vessels. Primary hæmorrhage.	*At the Dressing Stations.* (1) *Arterial bleeding.*—Ligature at the point of bleeding, both central and peripheral. Ligature at the point of selection is only to be undertaken when ligature at the bleeding point is impossible or exceptionally difficult on account of its anatomical position, because there is danger of secondary hæmorrhage when collateral circulation is established. Compression, plugging, and other methods of stopping hæmorrhage are contra-indicated.	Wounds of blood-vessels, on account of danger of secondary hæmorrhage, are unfit for transport. When they must be re-	In cases of acute anæmia, direct transfusion of blood should be practised at the aid-post and dressing stations; in the field hos-

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(2) *Venous bleeding.*—Double ligature, as in the case of arteries, is seldom necessary in the case of venous bleeding; usually raising of the limb and a compress with aseptic gauze are sufficient. (3) In bleeding from both arteries and veins, the arteries only should be ligatured; the veins, for fear of gangrene, should only be stitched according to circumstances.	moved, the first cases to evacuate are those in which the vessels have been ligatured. Cases in which the vessels have not been ligatured must be removed only under medical supervision. Careful immobilization of the limb must be effected in every case before removal.	pitals subcutaneous injections of normal salt solution and rectal injections should be used.
	Traumatic false aneurism.	*At the Dressing Stations and Field Hospitals.* Operations should be performed in the first twenty-four to forty-eight hours on account of danger of secondary hæmorrhage during transport, or gangrene on account of blocking of collateral circulation by hæmatoma, and also on account of danger of infection. The comparatively slight operation required at this stage of the formation of aneurism consists:— (1) In opening up the wound; or, if this is at some distance, the tumour. (2) In exposing the artery and ligaturing above and below and also any branches. (3) When the veins are also wounded, in stitching the vein. (4) In stitching the wound and draining through its most dependent part. The operation must be performed in any case during the first forty-eight hours, at the dressing station if there is a surgeon of much experience and if the circumstances are otherwise favourable—if not, at the field hospital.	—	Traumatic aneurisms often escape notice, and are treated as simple wounds because (*a*) primary bleeding is often slight, (*b*) diffuse hæmorrhage cannot be recognized, (*c*) pulsation and thrill on placing the hand over the spot are often wanting in early cases, (*d*) the peripheral pulse can be felt. Auscultation almost always clears up the condition (intermittent, re-

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
				mittent, or continuous swish). The symptoms can appear very early; consequently suspicion of injury to blood-vessels is to be investigated at the aid post, in order not to miss aneurism and to send such wounds as quickly as possible to the dressing station. Small wounds of entrance and exit are to be treated expectantly, when bleeding ceases spontaneously without definite sign of wound of blood-vessels. When portions of limbs have been shot away and there are extensive lacerations and when amputations cannot be performed, all the important blood-vessels are to be tied, even though bleeding has ceased.
3	Gun-shot wounds of nerves.	*At the Dressing Stations.* Primarily to be treated expectantly. The treatment of complicated wounds of the soft parts is to follow the principles laid down under 1.	To be evacuated to the lines of communication medical units.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
4	Gun-shot wounds of the bones of extremities	*At the Dressing Stations and Field Hospitals.* (1) The principle is to conserve the limb to the utmost possible extent. (2) Complicated wounds of the soft parts are to be treated according to the principles of treatment of simple wounds of the soft parts, only loose splinters of bone that are exposed may be removed and must be removed by forceps. (3) Wounds which require urgent primary examination, especially when there is much injury to the soft parts, must be handed over to the field hospital. There, loose fragments are to be removed; any adhering to the periosteum are to be removed only when they interfere with drainage; dislocated fragments are to be brought into position, sharp points and ends made smooth, and the wound drained. (4) The wound is covered with a protective dressing at the dressing station. The immobilization of the limb according to the nature and site of the wound, the material available for immobilization, the time and assistance available, will be effected by means of plaster of Paris bandages or splints. (Plaster of Paris, pasteboard, wood, metal.) More details with regard to fracture of patella are noted under the individual bones. Principles to be followed in applying an immobilization dressing:— (*a*) Exact adaptation of fractured ends and extension under chloroform. (*b*) Sufficient support especially to parts exposed to pressure. (*c*) Immobilization of the joints distal and proximal to the fracture bone. (*d*) The dressing must not go round a portion only of the limb but must commence from the periphery. (*e*) Fingers and toes are to be left free. (*f*) In applying the dressings the bandages must not be drawn tight, as otherwise they will stop the circulation. (*g*) In applying the plaster of Paris bandages the fracture must be systematically indicated on the bandage, while it is still moist, with a coloured pencil, showing the position of wounds of entrance and exit and the direction of the wound. In cases where the wound apertures are large, windows must be cut out by a cross cut over the spot where a ball of cottonwool is included in the plaster of Paris while the bandage is still wet.	Patients with gunshot fractures of the long bones should be kept, according to circumstances, some time in the field hospital. Removal makes the prognosis more unfavourable. For additional rules see Gunshot fractures of individual bones.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(5) Primary amputation of the limb at the dressing station is seldom indicated but would be performed generally :— (*a*) When the limb is shot away—for the purpose of making a good stump. (*b*) When the fracture is complicated with very extensive injury of the soft parts. (*c*) When the large blood-vessels and nerves have been ruptured, with extensive injury to bone. The operation wound should not be sutured in the first instance, but suitable flaps should be formed; as little tissue as possible to be removed. Shock and acute anæmia contra-indicate operative interference.		
5	Gun-shot wounds of the joints	*At the Dressing Stations and Field Hospitals.* (1) *Principles.*—Conservative treatment to the utmost limit. (2) Complicated wounds of soft tissues to be treated according to the same principles as simple wounds of soft tissues. (3) In extensive splintering with much contamination of the soft parts primary arthrectomy to be performed, but only in the field hospitals. The joint to be freely opened generally by the normal resection incision; formation of simple wound conditions; removal of destroyed soft parts, loose splinters, foreign bodies, &c.; rounding off ends of bones; chiselling of portions of bone, if they interfere with drainage; drainage of joint. Ordinary primary resections are not to be undertaken in any case. (4) A protective dressing will be applied to the wound and the principal bones of the joint immobilized at the dressing station. Other details are given under Gunshot wounds of individual joints. (5) Indications for primary removal of the limb are the same as in No. 4.	Early evacuation is necessary because of the need of careful after treatment. This can be carried out when the plaster of Paris bandage has hardened. For exceptions in the case of wounds of the hip joint see under No. 27.	Doubtful wounds of joints are to be treated primarily as if they were actual wounds of the joint.
6	Gun-shot wounds of the skull	*At the Dressing Stations and Field Hospitals.* (1) All dressings must be unconditionally removed at the dressing station for the purpose of precise diagnosis and for examination of the wound. (2) Even the smallest wound in the head must not be neglected on account of the great danger of infection. The area around each wound of the head must be very carefully disinfected (shaved, disinfected and washed with ether). The shaving must not be left to subordinate personnel, but	If possible, avoid transport. When evacuation is compulsory, transport on field stretchers, in hospital trains or boats is permissible.	In considering the indications for operative interference, transverse wounds must be distinguished from tangential wounds.

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		entrusted only to the hands of medical officers. (3) Penetrating wounds and wounds with lodged missiles are as a rule not to be interfered with by operation. They are to be covered with a protective bandage after disinfection of neighbouring parts at the dressing stations, the dressing being fixed by a starch gauze bandage. (4) Primary operative interference is necessary in the following conditions:— (a) Splintering of the bones of the skull, chiefly when it is hit tangentially, a condition that is of frequent occurrence. This is associated with great danger of infection. Operative interference consists of careful removal of splinters. Here "too much" is better than "too little," since only a thorough operation assures asepsis. Any necessary incision into the soft parts may either unite the two wound apertures or be in the form of a semi-circular incision over the seat of fracture. Avoid cross incisions. Resulting loss of tissue to be filled in by transplantation, as a secondary operation, subsequently. This operative interference can be postponed, as a rule, until the wounded man arrives at the field hospital, and should be undertaken at the dressing station only when there is no prospect of his reaching the field hospital within twenty-four nours after injury. (b) Bleeding from the middle meningeal artery (gradually increasing symptoms of pressure). (5) In wounds of the skull with coma, watch the bladder, and draw off urine.		Whereas the former are to be treated expectantly, the latter must have operative interference. As a practical method of distinguishing the two conditions, consider the relationship of the transverse line through both wound apertures to the bridge of bone between them. If the length of the bridge is greater than the line through the two apertures then treat expectantly; if it is smaller, operate.
7	**Gun-shot wounds of the upper part of the face.**	*A. At the Dressing Stations.* (a) Wounds of soft parts to be treated according to general principles. Extensive loss of soft tissues or bones, by parts being carried away, requires careful plugging. (b) Stopping hæmorrhage from superficial arteries should be effected by tying the bleeding points; in case of severe arterial bleeding from deep tissues (*i.e.*, from the internal maxillary or internal carotid), when the wounded vessel cannot be located, the external carotid must be ligatured at the point of selection. If this does not stop the hæmorrhage, the internal carotid must be ligatured. In these cases plugging the wound is not permissible.	Earliest possible evacuation to lines of communication medical units is necessary, on account of the necessity of careful nursing and after-treatment. During transport care must be	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(*c*) In severe continuous bleeding in the oral cavity or with extravasation of blood beneath the mucous membrane of the throat and mouth with commencing difficulty in breathing, immediate tracheotomy is necessary. (*d*) When the superior maxilla is fractured but the palate intact, plug the nostrils after applying a dressing to the wound. If the hard palate is fractured, especially the alveolar process, in addition to plugging the nostrils, place a pad of cotton-wool between the teeth and base of the maxilla. (*e*) In wounds of the nose, with severe bleeding, plug with sterile gauze. If there is dislocation, reduce with suitable instruments (claw forceps and catch forceps), and keep the fragments in place with a gauze plug. *B. In the Field Hospitals.* (*a*) Clean wounds of the face, lips and ears are to be sutured. When wounds are much contaminated, the parts to be fixed in position with one or two stitches. (*b*) In severe dislocation of fragments of the superior maxilla wire sutures are required, the teeth and all fragments adherent to soft parts being preserved. (*c*) Wounds with fractures and loss of parts should be syringed with disinfectant solutions. (*d*) Prepare for artificial feeding with stomach tube.	taken to provide for artificial feeding and changing of dressings (*e.g.*, in hospital boats and trains, &c.). In cases where there is danger of secondary hæmorrhage, the wounded are not to be placed in the category of those fit for transport.	
	Gun-shot wounds of the lower part of the face.	*A. At the Dressing Stations.* (*a*) Treatment of wounds of the soft parts follows the general principles. (*b*) Stop bleeding from the lingual, external maxillary, internal maxillary or facial arteries. (*c*) Perform tracheotomy when there is bleeding into the oral cavity, and when there is interference with respiration on account of extravasation of blood between the gums and jaw, or beneath the mucous membrane of the base of the oral cavity and tongue. (*d*) Draw the tongue forward and fix it to the cheek when there is dyspnœa on account of its falling back either from dislocation backwards of a fractured middle part of the jaw or injury to the lingual muscles. (*e*) In fracture of the lower jaw fix the fragments together with a chin bandage.		

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		B. In the Field Hospitals. (*a*) In fractures of the lower jaw fix the fragments together by wire placed round the teeth, if the patient can stand it and the teeth are good. Otherwise wire the fragments together. (*b*) Resect the jaw either partially or totally in cases where there is extensive splintering of the inferior maxilla. (This is of rare occurrence.) (*c*) Syringe thoroughly with disinfectant solutions wounds with fractures and loss of tissue. (*d*) Prepare for artificial feeding with stomach tube.		
8	Gun-shot wounds of the larynx and trachea.	*At the Dressing Stations.* (1) Remove cause of immediate danger to life from bleeding, and then keep the air passage free. (2) Any interference with respiration in wounds of the larynx or trachea, which must always be considered a cause of possible asphyxia, is an unconditional indication for the performance of tracheotomy. This is to be carried out wherever the patient comes into the hands of a medical officer. It is also to be undertaken in those cases which come into medical hands already almost asphyxiated or *in extremis mortis*, since operative interference in these cases may save life. (3) Prophylactic tracheotomy is also to be performed, even when there are no immediately urgent symptoms, in those cases where the nature of the anatomical lesion or the symptoms lead one to expect the onset of severe obstruction to respiration, namely :— (*a*) When there is disturbance in breathing from any cause, or change in the voice. (*b*) On the first appearance of subcutaneous emphysema. (*c*) In fractures of the cricoid and thyroid cartilages. (*d*) When foreign bodies (missiles and foreign bodies carried into the wound indirectly), are lodged in the larynx or immediate neighbourhood, unless they can be easily removed. (*e*) In graze wounds, which penetrate to the mucous membrane. (*f*) When there is danger of secondary hæmorrhage.	Wounds of the larynx and trachea should be evacuated early but only under medical supervision.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(*g*) In all cases when the wounded man must be transported without medical supervision. Only those cases may be exempt from prophylactic tracheotomy which do not present these conditions. To this category belong some wounds, caused by hard-mantled bullets, which often heal without any symptoms.		
9	Gun-shot wounds of the œsophagus.	*A. At the Dressing Stations.* (1) Protective dressing to be applied after careful stopping of hæmorrhage, and if there are no urgent symptoms connected with the respiratory organs. (2) Prophylactic tracheotomy:— (*a*) When the larynx or trachea are injured at the same time. (*b*) Also when there is no such complication, on the first appearance of obstruction to respiration or alteration in the voice. *B. In the Field Hospitals.* Artificial feeding; at first by the rectum, afterwards with stomach-tube, or possibly gastrostomy. The œsophagus must never be sutured in the first instance.	Early evacuation under medical supervision to units on the lines of communication.	
10	Gun-shot wounds of the lungs	*A. At the Dressing Stations.* (1) Apply a protective dressing (fixed in cases of small wounds with adhesive plaster), after bleeding has been stopped. Inject 0·02 grm. morphia subcutaneously. (2) Hæmo- and pneumothorax, as also (3) Hæmoptysis, do not call for therapeutic interference. (4) In hernia of the lung, treat expectantly, as pneumothorax and infection of pleural cavity may be caused if the lung is replaced. *B. In the Field Hospitals.* (1) If urgent symptoms occur, puncture hæmothorax cases under aseptic precautions. The puncture should not be made for six or eight days, and only a small quantity of blood aspirated. It must not be made through the wound apertures. (2) Under urgent symptoms, aspirate in cases of pneumothorax. If no result, perform thoracotomy and drain the pleural cavity, always under strictest asepsis. (3) In extensive subcutaneous emphysema, multiple punctures or incisions in the skin may save life.	Transport is not permissible in cases of severe hæmo- and pneumothorax with urgent symptoms. Cases such as those in which the track of the wound is usually internal to the mammary line are to be handed over to the ambulance section of the divisional medical unit. Other cases of wounds of	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
			the lung bear transport well after cessation of hæmoptysis. Aspirated cases are not to be moved.	
11	Gunshot wounds of the heart	*A. At the Dressing Stations.* Do not attempt operative interference. Simply cover the wound and inject morphia as a sedative. *B. In the Field Hospitals.* Operative interference under strictest asepsis is permissible when there are urgent symptoms of hæmorrhage into the pericardium.	Transport is usually not permissible on account of severe hæmorrhage into the pericardium which generally accompanies these wounds.	
12	Gunshot wounds of the abdomen	*At the Dressing Stations and Field Hospitals.* (1) As a rule do not attempt operative interference. The usually small wounds of entrance and exit should be covered with a protective dressing without removing the patient from the stretcher. Subcutaneous injections of 0·02 grm. morphia to be given. No opium by the mouth. No restoratives or stimulants are to be administered, as they often cause peristalsis. (2) Primary operative interference is indicated only under the following conditions:— (*a*) In hernia of the intestine and omentum. If the intestine protrudes, it must be replaced after careful cleansing, provided it is uninjured and there are no suspicious appearances. Should it be injured in a small part only the wound should be stitched before the intestine is replaced. In both cases careful plugging of the abdominal cavity and closing of the abdominal wound to the point where the abdominal plug is brought externally must be carried out. When the hernia is constricted, the wound must first be enlarged. When there is extensive injury to the protruding gut, or if its becoming healthy is doubtful, it should be stitched to the external wound in order to bring about an artificial anus. If the protruding gut already shows signs of gangrene it should be brought	Not to be evacuated. Complete rest after the injury is the main condition for spontaneous recovery. This often occurs on the field, if the wounded are left alone without disturbance, food or drink for four or five hours. Then careful removal on stretcher to the dressing station. After being attended to at the dressing station either expectantly or by operation,	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		outside the wound. In all these cases careful and thorough plugging of the abdominal cavity is necessary. When the omentum protrudes it should be resected and replaced, and the cavity *plugged*. (*b*) In extensive destruction of the abdominal walls with wound of the intestines, the operation consists in stitching the latter, if the wounds are small, or in fixing the injured part to the abdominal wound, if large. Subsequently in both cases careful plugging of the cavity and reducing the size of the wound of the abdominal walls must be carried out. (*c*) In small wound apertures in the abdominal walls, when it is clear that there is injury to the intestine which cannot recover without operative interference; as, for example when tape-worms or round worms come out through the wound, or foreign bodies, such as splinters of wood, &c., have been driven into it. The operation consists in opening the abdominal cavity over the wound in the same way as under (*b*). When in these three cases the chances of favourable results are at a minimum, operative interference must nevertheless be undertaken, in consideration of the fact that without it fatal results must occur. (*d*) In increasing, dangerous, intraperitoneal bleeding, as in gunshot wounds of the liver, spleen, or mesenteric blood-vessels. In these cases laparotomy must be performed only by surgeons who are thoroughly skilled in the technique of laparotomy. It must also be left to them to determine whether the external conditions permit laparotomy to be undertaken or not. (3) Secondary hæmorrhage. (*a*) Injection of morphia. (*b*) Systematic feeding, by which for the first two days no food is to be given except teaspoonfuls of cold tea after twenty-four hours to relieve thirst. After forty-eight hours, fluid nourishment such as milk, coffee, eggs, soup, &c., according to the resources available. After fourteen days ordinary diet allowed.	the wounded should be handed over to the ambulance section of the divisional medical unit.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(c) Ice-packs to be used in every case of wound of the abdomen. (d) If peritonitis commences do not interfere; apply warm fomentations. In general peritonitis, if the external circumstances are very favourable laparotomy may be performed.		
13	Gun-shot wounds of the kidneys.	*At the Dressing Stations and Field Hospitals.* (1) Surgical operations on the kidneys will not be undertaken primarily. (2) Protective dressing, with means of unobstructed drainage (drainage tube), forms the principle of primary treatment. (3) Primary operative interference is indicated at the dressing station only in the cases of dangerous bleeding from the external wounds in extensive injury of the kidney and its capsules, or dangerous intraperitoneal bleeding from the kidneys when the peritoneum has been opened up. In renal intraperitoneal bleeding the procedure is to be the same as in other intraperitoneal bleeding, with the same restrictions as to operative interference. In dangerous bleeding through the external wound cut down to the kidney and act according to what is discovered (ligature of bleeding vessels, or nephrectomy). (4) Hæmaturia, even though severe and continuous, calls for no operative interference and also no internal medication. (5) In case of blood-clots forming in the bladder, pass a large silver catheter, break up the blood-clot, draw off contents of bladder and wash out with alkaline solution according to circumstances. (6) In case of prolapse of the kidney in extensive wounds of the soft parts, such as graze wounds from large projectiles, replace the prolapsed kidney, plug or apply suitable fixation stitches. (7) In after-treatment, be extremely careful to avoid infection, especially in primarily formed urinary fistula. (8) Extravasation of urine with perinephritic abscess requires extensive incisions.	Do not remove further back. Do not evacuate. In case of retreat, kidney and bladder cases are to be handed over to the enemy.	
14	Gun-shot wounds of the bladder	*At the Dressing Stations and in the Field Hospitals.* (1) Primary treatment depends on the principle of maintaining a free flow of urine. (2) Operation will be performed at the dressing station : (a) In cases of extensive injury to the bladder, in which the flow of urine ceases in such a manner that urine	—	In conservative treatment, continuous catheterization is to be avoided by instructing

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		neither appears through the external wound nor by the natural passage, and the sense of burning in the urethra and absence of desire to urinate indicate that the bladder is empty. (*b*) In cases where urine escapes by a primary urinary fistula externally, but is complicated with an internal urinary fistula, and symptoms either of extravasation of urine or of commencing peritonitis appear. (3) Conservative treatment will be applied— (*a*) In cases where the bladder wound has closed of itself and in such a way that no urine escapes into the surrounding tissues. These cases are characterized by absence of primary urinary fistula, usually by non-interference with micturition; or, if there is interference with micturition, by presence of urine in the bladder. (*b*) In cases where there is communication with the parts surrounding the bladder, but where the urine escapes through the existing primary fistula externally without causing symptoms of injurious effects to the peritoneum or the tissues anterior to the bladder. Such cases are to be treated by simple occlusion of the wound. (4) Operative interference will consist of— (*a*) Medial laparotomy, stitching of the bladder wound and swabbing out the peritoneal cavity, in intraperitoneal injuries. (*b*) In extraperitoneal injuries, in opening the prevesical connective tissue, stitching the bladder wound, if this is possible; otherwise in draining the bladder and finally plugging the prevesical tissues. In cases where it is doubtful whether the injury is intra- or extraperitoneal, open into the prevesical tissues to begin with. If the injury is found to be extraperitoneal, proceed as in (*b*). Should there be no lesion of the anterior or lateral walls of the bladder, the bladder must be opened on its anterior or extraperitoneal surface in order to determine the site of the wound, *i.e.*, whether it is extra-peritoneal on its posterior wall, or intra- or sub-peritoneal. If it is intraperitoneal laparotomy must be decided upon. (5) In injuries of the bladder the patient must be placed in a position that permits of the urine escaping freely.		the patient to urinate frequently when micturition is undisturbed; and in cases where power to empty the bladder is lost, by aseptic catheterization used frequently.

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
15	Gun-shot wounds of the urethra.	*At the Dressing Stations.* (1) Introduce and tie in a catheter (medium-sized Nelaton). This is usually possible as small calibre hard-mantled bullets generally only partially wound the urethra. Should it be impossible to pass a Nelaton's (soft) catheter, a gum-elastic catheter with Mercier bulb should be used. (2) Should catheterization fail or should signs of extravasation of urine occur, perform external urethrotomy and introduce a catheter through the anterior urethra. In cases where a buttonhole operation cannot be carried out on account of external conditions, or when the proximal end of the urethra, when completely severed, cannot be joined after external urethrotomy, perform suprapubic puncture, or posterior catheterization.	When a catheter is tied in, removal and evacuation are permissible under medical supervision.	
16	Gun-shot wounds of the external organs of generation.	*A. At the Dressing Stations.* Apply a protective dressing. *B. In the Field Hospitals.* (1) In extensive wounds of the scrotum and destruction of testicular substance, castrate. (2) In extensive laceration of the penis, amputate.	Removal and evacuation are permissible.	
17	Gun-shot wounds of the spinal column *without* injury to the spinal cord.	*A. At the Dressing Stations.* Apply a protective dressing. *B. In the Field Hospitals.* On symptoms of infection occurring, enlarge the wound, carefully remove all splinters of bone and lacerated tissue, or lodged missiles, and gouge away spongy bone, which may become the seat of abscess, until the dura is bare. In doing this, in order to avert infection of the dura, "too much" is better than "too little."	In consideration of the fact that very careful hospital nursing is necessary in wounds of the spinal column, such cases should be evacuated as quickly as possible to the base (should it be impossible to attend to them properly in the area of operations), in ambulance trains or	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
	Gunshot wounds of the spinal column *with* injury to the spinal cord.	*A. At the Dressing Stations.* Do not attempt operation, for in the majority of cases accurate diagnosis is impossible, and primary operative treatment is objectless. Therefore apply a protective dressing and watch the bladder. In every injury of the spinal column the bladder must be examined even at the dressing station in case of distension from retention of urine. *B. In the Field Hospitals.* (1) Precautionary measures against bed sores. Bony projections to be covered with ointment lint, and the patient placed on a well-stuffed hard mattress. (2) Watch the bladder. Catheterize aseptically (3) On symptoms of infection appearing, proceed as in wounds of the spinal column without implication of the spinal cord.	boats. In order to minimize the bad effects of transport the spinal column should be immobilized by a plaster of Paris jacket.	
18	Gunshot wounds of the scapula.	*A. At the Dressing Stations.* Primary protective dressing. Mitella bandage. *B. In the Field Hospitals.* Bandage the arm to the thorax, which is usually wounded also, in such a position that the fixed arm will keep the separated fragments of the scapula in apposition. In complete dislocation of the articular end of the scapula, the dislocation is best reduced by a Sayre's bandage and axillary pad.	Removal and evacuation depend on the degree of injury to the lungs, which may complicate a gunshot wound of the scapula.	
19	Gunshot wounds of clavicle.	*A. At the Dressing Stations.* Check hæmorrhage and apply protective dressing. Apply a Mitella bandage, fixing the arm to the side with several turns of the bandage. *B. In the Field Hospitals.* Reduce the fracture, immobilize in a position in which the displacement can be rectified. For the majority of cases of gunshot frac-	Transport and evacuation are influenced by complications such as wounds of lungs or blood-vessels.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		ture of the middle of the clavicle with normal displacement, the most suitable appliance is a Sayre's adhesive plaster bandage with Landerer's modification, and use of axillary pad. Dust desiccating powder in the axilla. When there is at the same time a wound of the thorax, necessitating the patient lying in bed, lower the shoulder or let the arm hang down. Should there be no displacement of the fragments apply a Mitella bandage and fix the arm to the side.		
		At the Dressing Stations and in the Field Hospitals.		
20	Gun-shot wounds of the shoulder joint	(1) Primary treatment in accordance with the principles applicable under No. 5. (2) At the dressing station the joint can be fixed by means of a pasteboard splint. The splint is to be applied on the outer aspect of the arm, which is to be bent at right angles, is to form a cap over the shoulder-joint and extend to the tips of the fingers. The arm is to be fixed to the side slightly abducted with the axilla well padded with a pad of wood-wool.	Transport and evacuation as under No. 5.	
		A. At the Dressing Stations.		
21	Gun-shot wounds of the humerus	(1) Primary treatment according to principles described under No. 4. (2) All fractures of the humerus are to have a pasteboard splint primarily applied. Plaster of Paris bandages round the limb are not to be used on account of the primary considerable swelling of the soft parts by effused blood. Two splints are usually required for fixing the fracture, an outer pasteboard splint on the external aspect fixing the shoulder-joint and extending to the tips of the fingers and a small splint on the internal aspect of the upper arm. If necessary a third small pasteboard splint can be applied to the posterior surface. Pad the axilla and fix the arm to the side with starch bandage. The starch bandage can be strengthened by two bands of plaster of Paris round the arm and thorax and over the shoulder and forearm. *B. In the Field Hospitals.* After two or three days when the swelling of the soft tissues has subsided apply the normal plaster of Paris bandage.	Removal and evacuation is permissible immediately after the bandage has hardened. In gun-shot fractures with extensive injury to soft parts and lodged missiles, evacuation is only permissible when there is assurance that the patient will come under medical care and hospital treatment within twenty-four hours. Cases of amputation and ex-	In gunshot fractures of the middle third of the humerus remember the possibility of the radial nerve getting between the broken fragments. The symptoms are severe shooting pain in the line of the nerve when the ends of the fragments are rubbed togther in replacing them. The nerve must be freed by extension and circumduction movements.

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
			articulation can be moved twenty-four hours after operation if necessary and the blood-vessels are secured. If however circumstances permit, the patients should be kept a few days in the field hospital after amputation before evacuation.	
22	Gun-shot wounds of the elbow-joint	*At the Dressing Stations and in the Field Hospitals.* (1) Primary treatment according to principles described in No. 5. (2) Fixation of the joint at the dressing station by the same splint as is used in the case of the shoulder-joint.	Treatment and evacuation as under No. 5.	
23	Gun-shot fractures of the forearm	*At the Dressing Stations and in the Field Hospitals.* (1) Primary treatment according to the principles described in No. 4. (2) All gunshot wounds involving fracture of the bones of the forearm, which are to be treated conservatively, will have splints systematically applied at the dressing stations, whether they be gunshot fractures of the radius only or so-called "typical position" fracture of both bones, requiring a special form of splint and bandage. (3) Splints or roller plaster of Paris bandages may be employed. The plaster of Paris bandage is permissible at the dressing stations in all forms of fracture of the forearm, in which an aseptic course is expected. Swelling of the soft tissues in these fractures does not occur to such a degree as in fractures of the humerus so that there is no risk of displacement of the fragments with a plaster of Paris bandage, if the course is aseptic. If the prognosis as regards	Transport and evacuation as under No. 21.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		asepsis is unfavourable or doubtful, fix the arm with a splint. (4) In both forms of fixation, attend to the following principles:— (*a*) Apply the splints with arm bent at right angles and forearm supine. (*b*) No displacement of fragments must occur. This happens when the plaster of Paris bandage is too tight, and when a splint is too small. (*c*) The bandage must be carried to the middle of the upper arm and should leave the fingers free when there is not very severe injury of the soft parts. (*d*) The bandage must be well padded. (5) Splints (pasteboard and plaster of Paris) will be applied on the palmar and dorsal surfaces. The tendency of the fractured ends to be displaced inwards is best prevented by padding the centre of the splint convexly on the palmar side. (6) Fractures of the radius at the so-called typical sites require some deviation from the systematic treatment detailed above. In these cases the splints used under peace conditions (Roser's dorsal splint, Nelaton's pistol splint) can be easily improvized. In the field a fixation bandage can be applied with the hand in a position of pronation, flexion and abduction, by the patient being made to place it in as strongly abducted position as possible on his own knee bent at right angles. A calico bandage dipped in plaster of Paris can then be applied on the dorsal surface of the hand from the metacarpo-phalangeal joint halfway up the forearm, when the hand is in this position of flexion, pronation and abduction.		
24	**Gun-shot wounds of joints of the hand.**	*At the Dressing Stations and Field Hospitals.* (1) Primary hæmorrhage to be treated according to the principles laid down in No. 5. (2) Fixation of the joint to be made by splints of plaster of Paris or pasteboard. The fingers and elbow-joint flexed at right angles are to be included in the bandage. Mitella bandage.	**Transport and evacuation as in No. 21.**	**Injection of tetanus antitoxin to be used in all gunshot wounds of the hand and its joints at the dressing stations.**
25	**Gun-shot wounds of the hand.**	*At the Dressing Stations and Field Hospitals.* (1) In spite of the fact that infection often supervenes, conservative treatment according to the principles laid down under No. 4 is to be employed. (2) Fix the hand with a pasteboard or wooden splint.		

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(3) Hæmorrhage from the palm of the hand is not to be treated by plugging the wound, but by ligaturing both ends of the divided vessels, as this is the only way of preventing secondary hæmorrhage, which will endanger the life of the patient in case of infection, and may render amputation necessary in order to check the bleeding. (4) In wounds of the phalanges active measures, such as amputation or exarticulation, are indicated, as a rule, in order to favour healing. Conservative treatment is indicated only in cases of wounds of the thumb and index finger.		
		At the Dressing Stations and Field Hospitals.		
26	Gunshot wounds of the bones of the pelvis	(1) The important point in connection with these wounds is that they are at times complicated with injury to the abdomen, bladder or urethra. (2) Uncomplicated wounds of the pelvis should be treated primarily according to general principles. (3) When fixation of the fractured bones cannot be obtained, avoid applying a fixation bandage. (4) When the wound is complicated with opening into the abdominal cavity and injury to the urinary passages, act according to principles indicated in Nos. 12 and 15.	Uncomplicated wounds of the pelvis, as well as those complicated with wounds of the urethra, the latter after urethrotomy has been performed, can be removed or evacuated. Pelvic wounds complicated with opening into the peritoneum and bladder, or wounds where there is any suspicion of such complications, must not be removed or evacuated.	
		At the Dressing Stations and Field Hospitals.		
27	Gunshot wounds of the hip joint.	(1) Primary hæmorrhage to be treated according to the principles detailed under No. 5. (2) Fixation of the joint at the dressing station must be effected with great care on account of the risk to such injuries during transport.	In consequence of the great danger of transport such injuries should be	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		(3) The one reliable fixation dressing is the plaster of Paris bandage. It must be applied with limb slightly abducted, taking into consideration possible ankylosis subsequently, and must include in addition to the injured joint the hip joint and thigh of the sound limb. A cross back piece of wood is to be included in the plaster of Paris in the middle of the thigh in order to strengthen the bandage and give support in lifting the patient. Strengthening of the plaster of Paris bandage is desirable by means of splint material, such as pasteboard, wood, splinters or thin strips of metal, and it should extend from the sole of the foot to the ribs. Long splints, i.e., external and back splints, extending from the sole of the foot to the ribs, may also be used for fixing the joint; but are only to be used exceptionally to enable the wounded man to be moved.	left six to eight days, if possible, in the field hospitals.	
28	Gunshot wounds of the femur.	*At the Dressing Stations and in the Field Hospitals.* (1) Primary treatment is to follow the principles laid down under No. 4. (2) Immobilization of the limb. In the hands of skilled surgeons the plaster of Paris splint is the normal splint to use; on the other hand, those who have not thoroughly mastered the technique of the plaster of Paris splint and method of extension and reducing the fracture, should apply only starch bandages strengthened with splints. Such splints applied at the dressing station are only provisional for purposes of transport, and must be replaced as soon as possible (i.e., in the field hospitals) with plaster of Paris splints or extension splints. (3) Every fixation dressing, whether splint or plaster of Paris, must follow correct adaptation of the fractured ends of the bone, together with suitable extension. This is usually only possible under chloroform. (4) The plaster of Paris splint must extend from the toes to the level of the umbilicus and must include the opposite hip joint and thigh. A cross-piece of wood must be inserted in the bandage at the middle	Removal and evacuation shortly after the injury, especially if an unsatisfactory splint has been applied, makes the prognosis less favourable. Accordingly, if the external conditions permit, fractures of the femur should be kept six to eight days in the field hospitals. If this is impossible, fix the limb carefully and	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
		of the thigh. When a sparing use of plaster of Paris is urgently demanded at the dressing station, the bandage is to be strengthened by a wood splint from the sole of the foot to the ribs and by small splints. (5) Splints must extend like the plaster of Paris bandage from the toes to the ribs. The external splint is the main splint. It must be well padded, a hand's breadth in width, and extend to the ribs; pasteboard and small splints are added. In exceptional cases, for purpose of transport, placing the limb on its side, according to Pott's method, or flexing it in a double inclined plane, may be useful.	carry the patient on the same stretcher as he is lying on. As regards limitation of transport in special cases and in amputation cases, the remarks in No. 21 apply.	
29	Gun-shot wounds of the knee joint	*At the Dressing Stations and Field Hospitals.* (1) Primary treatment to be in accordance with the principles laid under No. 5. (2) The joint to be fixed at the dressing station in a slightly flexed position by means of a well-padded plaster of Paris bandage, including the hip joint, or by a long splint extending to the ribs and strengthened by turns of a plaster of Paris bandage.	Transport and evacuation as in No. 5.	
30	Gun-shot wounds of the bones of the leg	*At the Dressing Stations and Field Hospitals.* (1) Primary treatment according to the principles laid down in No. 4. (2) Plaster of Paris bandage is the normal fixation apparatus. Splints are only to be used in those cases where the prognosis as regards asepsis is doubtful. Such wounds must be re-examined after twenty-four or forty-eight hours and the splint replaced by a plaster of Paris bandage if the wound is aseptic. (3) In applying the plaster of Paris bandage attend to the following points:— (*a*) It must be well padded. (*b*) It must reach half way up the thigh. (*c*) Coaptation of the fractured bone can frequently take place only under an anæsthetic. (*d*) The foot must be in a position at right angles to the leg. (*e*) There must be no turning of the lower fragment on its long axis. The great toe, the middle of the patella and the anterior superior iliac spine must be in one line. A crooked position of the leg is to be avoided. (4) Volkmann's splint is the best adapted as a splint for those cases which are treated by means of splints.	Transport and evacuation as in No. 21.	

Consec. No.	Nature of the wound	Dressing and operative interference	Transport and evacuation	Remarks
31	Gun-shot wounds of the ankle joint	*At the Dressing Stations and Field Hospitals.* (1) Primary treatment to be in accordance with the principles under No. 5. (2) Fix the joint at the dressing station either on a Volkmann's splint or in a well-padded plaster of Paris bandage reaching above the knee joint, and immobilizing the ankle joint in a rectangular position, midway between pronation and supination.	Transport and evacuation as in No. 5.	
32	Gun-shot wounds of the foot	*At the Dressing Stations.* (1) Wounds of the soft parts to be treated according to general principles. In spite of the frequency of infection in these wounds, conservative treatment has usually good results. (2) Immobilization of the foot in the same position as in wounds of the ankle joint can be effected either by a Volkmann's splint, pasteboard splints, or plaster of Paris bandage. (3) Bleeding from the main vessels is not to be checked by plugging the wound, but by tying the divided ends of the vessels.	Transport and evacuation permissible.	
33	Wounds with lodged missiles	*A. At the Dressing Stations.* Non-extraction of bullets is the principle to follow. *B. In the Field Hospitals.* Removal of lodged bullets is only to be carried out under exceptional circumstances, when they cause painful or dangerous symptoms and when the operation can be performed easily and is likely to save further complications.		
34	Wounds by side-arms	*At the Dressing Stations and Field Hospitals.* (1) In cutting and punctured wounds, the treatment in general at the dressing stations should be confined to thorough checking of hæmorrhage and applying a covering dressing. Secondary stitching of the wound can be considered later. (2) In other respects follow the principles laid down regarding gunshot wounds.	Transport and evacuation are influenced by the nature and degree of the wound. In this respect the principles laid down in connection with gunshot wounds of the different parts of the body are applicable here.	

Travel.

SALMON FISHING IN HOKKAIDO.

By Major A. C. FOX.
Royal Army Medical Corps.

The following account of a fishing expedition which I made in the summer of 1910 to the island of Hokkaido may be useful to officers in the Corps whose lot it may be to serve in the "Far East"—viz., Singapore, Hong Kong or North China.

With the exception of an interesting article in the February number of the *Badminton Magazine* for 1910, by Major Lavita, D.S.O., late R.H.A., I do not know of any literature bearing on this subject.

Hokkaido, so named by the Japanese since it was taken over by them, was formerly known as "Yesso." It is a large island situated some 50 or 60 miles north of the main Island of Japan, and due east of Vladivostock. Its scenery is very fine, it is well wooded, and intersected by numerous fine rivers, which at certain seasons of the year, June and July, contain large quantities of very fine sporting fish known locally as "masu," which correspond to our grilse. They are in appearance and behaviour indistinguishable from our own fish, being pink-fleshed; they make capital eating. The fish take the fly readily and give quite as good sport as our own salmon at home do.

The masu "run" begins in the southern rivers early in June, taking place later as we proceed north, and terminates about the end of July, after which they cease to rise to the fly. The fish run up the rivers from the sea to spawn. Large numbers are caught by the Japanese and Ainus in traps of various descriptions. The fish are very highly prized as an article of diet, and high prices are paid for them in the large towns.

Amongst the Ainus they form the staple article of diet. These people are rapidly becoming extinct with the advance of civilization, they are simple savages and an interesting people to see, and are commonly spoken of as the "Hairy Ainus," owing to the amount of hair that grows all over their bodies.

But this a digression. To return to our subject, I cannot do better than to relate my own itinerary and experience. We will assume that the traveller arrives at Tokyo on June 1st, and puts up at the hotel of the same name, which I can recommend. The

first thing that he will have to do is to obtain a "boy" to act as his cook, camp servant, and factotum generally; he must be strong and able to speak a little English, as only Japanese is spoken once the traveller gets off the beaten track. Inquiries for a "boy" must be made at the hotel or through friends, sometimes a "boy" can be obtained through the agency of the "Welcome Society," which can be joined on payment of 3 yen (a yen = 2s.). This Society has been formed for the purpose of assisting foreigners visiting the country; but care should be taken to avoid engaging anyone of the nature of a "guide," who is very expensive and quite useless for the purpose. I obtained my "boy" through the help of an officer in the Indian Army, who

A Group of Ainus.

was then studying the Japanese language, and who very kindly lent me his own servant. As salary I paid him one yen a day and his expenses, which did not amount to much, as fish and rice formed his chief article of diet. Having secured his servant the sportsman should waste no time in Tokyo making purchases, but should at once proceed to Sapporo by rail. Before leaving Tokyo and civilization, I should recommend him to leave all superfluous non-sporting kit at the hotel where he is staying, the manager of the hotel will always readily take charge of it till the owner's return. Sapporo is a large Japanese town in Hokkaido, with some 80,000 inhabitants. It takes forty-four hours to reach

it from Tokyo. The railway service is very good, the trains being supplied with up-to-date restaurant cars and sleeping berths, and the fares are moderate. The passage across the Straits between Japan and Hokkaido is done very comfortably, excellent up-to-date steamers meet the principal trains. Timing himself to reach Sapporo, say, about June 5 or 6, the traveller should make this town his headquarters. There is a nice Japanese inn close to the station where good accommodation can be obtained, and where European food is supplied. There are several large shops in the town where all the necessary food supplies—viz., tinned meats, butter, milk, flour, oatmeal, &c., can be obtained of quite good quality and at a reasonable cost. I would not recommend the traveller to bring up any supplies from Yokohama, he will thus be saved considerable expense and trouble. The Japanese charge heavily for excess baggage on their railways. The supplies obtainable at Sapporo are quite good enough, except perhaps for the most fastidious individuals with very long purses—a class I should not recommend to undertake this trip, as they will probably have to put up with more roughing than would suit them. Sapporo also possesses a good Government bank where I would recommend the sportsman to deposit all his superfluous cash and only take up with him enough money in small notes, sufficient to pay current expenses—say 100 yen at the very outside for a three or four week's sojourn in the "wilderness," which should be ample to meet all his expenses, after he has laid in his stock of stores at Sapporo; probably he will not need half the sum. A two days' stay in this town should be sufficient to make all the necessary arrangements. Presuming that the sportsman has decided to follow the route I selected and has determined on trying the Suru river, which is one of the southern rivers, he will take train to a small wayside station called Numahatta, about five hours' railway journey. Here it is necessary to hire a "basha," or country vehicle, which is devoid of all springs and shaped after the fashion of a wagonette. A drive of about 16 miles across country, over what is supposed to be a "road," will take him to a small village called Mikawa; here he will be glad to leave his conveyance, as he will probably have experienced one of the roughest journeys, with the maximum amount of jolting, he has ever had in his life. It will be necessary to obtain another "basha" at Mikawa, and a further journey of 7 miles will take him to his first night's resting-place at a small village called Surafto, situated at the mouth of the Suru river. There is a

nice little Japanese inn here where only Japanese food can be obtained. Next day the journey should be resumed up the Suru Valley. I should recommend pony transport from this on, as the "roads" are not suitable for wheeled transport after the first 12 to 15 miles. Last year, when I made this trip, the River Suru was itself unfishable; a glance at it soon convinced me of that, so I did not attempt to fish it, but selected a large tributary of the river called Numabirakawa, which runs into the Suru river about 13 miles from its mouth. The reason why I considered it useless to waste time fishing the Suru was because the Japanese were felling large quantities of timber in its upper reaches and floating the logs down stream necessarily causing much disturbance of the water. That I was correct in my judgment was proved subsequently. Two sportsmen went up the Suru just above where I branched off, but after a week's assiduous effort with rod and fly came away in disgust without seeing a fish, though some 20 miles away I was having as fine sport as ever I had in my life. My own camp was placed in a delightful spot about 25 miles above the mouth of the Suru river, amidst most beautiful scenery and perfect surroundings. Here I stayed about a fortnight, and had capital sport from the middle to the end of June. A fair average day's catch amounts to five masu. On two of my best days I landed seven fish, averaging just under 6 lb. each. My heaviest fish on this trip weighed exactly 10 lb. All the fishing is done from the bank wading. The fish were caught on the fly, and were all gaffed and landed by myself. I was usually accompanied by one of the Ainus, who were only too willing to go out with me all day and carry my bag if I gave them the fish which I did not require for my own use; there was consequently no waste of fish. Thirty-nine pounds was the heaviest total bag I have had on any one day.

About the end of June, having exhausted my supplies, I returned to Sapporo. After renewing my stock, I decided to try the Shiribetz River. This is one of the western rivers; it is very easy to get at. By taking train to a large country town called Kuchan, which is only about four hours journey from Sapporo, and then marching some 10 or 15 miles up the river, good sport can be obtained. This river is much more accessible than the Suru, and does not entail so much roughing. Supplies are also more easily obtainable. Of course there are numerous other rivers all over Hokkaido. The fisherman has a large field to choose from. I have merely mentioned two of them which I have tried, and if he likes to go

further afield, fine sport, I believe, can be obtained on the Island of Saghalien. I had intended making the latter journey this summer, but the exigencies of the service prevented my doing so.

I will now briefly give some hints of value to the angler, the result of personal experience.

An Ainu Belle.

Climate.—This is much the same as an English summer ; warm clothing must be taken, and the older the better, as long as it is serviceable. Light clothing such as khaki is also necessary, with a solar topi, as the sun is frequently hot in the middle of the day, but a terai hat is usually all that is needed. A good cheap oilskin coat is useful as heavy rains often fall.

Kit.—Tents are in my opinion absolutely necessary if good sport is to be obtained, as the further one gets away from villages the better. I had a small 60 lb. Field Service Cabul tent. A light servants' tent is also useful. The usual camp furniture for an ordinary shikar expedition will be required. Mosquito nets, with head guards, and gauntlets should also be taken.

Fishing Tackle.—I had a 16½ ft. salmon rod by Farlow, which did me very well, but it was more powerful than was necessary. I should recommend a 14 to 15 foot grilse rod, with a reel sufficient to carry about 60 yards of line, some light salmon casts and a good gaff. Wading trousers, and brogues must also be taken; they should be strong, and of the best quality obtainable, as much hard walking and clambering from pool to pool has to be done.

Flies.—"John Scott" and the "Blue Doctor" were by far the best flies that I tried, but all the "Doctors" both the "black" and "silver" were good. The best sizes being Nos. 1/0 and 3/0.

Travel as light as possible.—The whole of my kit with tents, stores, &c., and servants' belongings went comfortably on two pack ponies, and did not exceed 200 lb; I did nearly all the marching myself on foot.

The Habits of the Fish.—To be successful at masu fishing, the angler must be prepared to shift his ground frequently. These fish never remain in any one section of a river for more than a few days at a time, but are constantly running up the river to the upper reaches where they go to spawn. If therefore the angler has searched one section of a river without finding any fish, he should work higher, and higher up, until he comes across them. This is a very important point to know with regard to these fish, and a want of knowledge of this has sent many a sportsman away from Hokkaido without ever having seen a masu. Another point I would impress on a sportsman is never to wait in the lower reaches of the river "till the water clears," if the river should happen to be in flood at the time, but march up to the fishing ground where you intend to begin work and wait there for the water to clear. My experience is that the best fishing is obtained in the upper reaches, and the rivers here are all fishable, and in good order on the fourth day after a flood, provided of course, no rain falls in the interval. Whereas the rivers down below very often never clear at all, or perhaps not for ten to fifteen days after a heavy rainfall, and their condition cannot, therefore, be accepted as a criterion as to the state of the water in the upper reaches.

Some readers may think I have laid unnecessary stress on

these details, but I have heard of so many men who have been disappointed in their expectations of sport in this country, that I shall offer no apology for mentioning these details, as I am sure their lack of success was due, entirely, to a want of knowledge of the conditions of the country and the habits of the fish.

Supplies.—Vegetables and eggs can be obtained in most places up country at farm houses and villages, but all other supplies must be bought at Sapporo.

This is a trip I can thoroughly recommend to any man in search of good salmon fishing, he should, however, be fairly strong, as he will have to do a good deal of hard rough work, but the climate is healthy and bracing, and the country very pretty. Good drinking water can be obtained anywhere outside the towns. Mosquitoes are at times troublesome. I don't think I have ever spent a more enjoyable sporting holiday anywhere. The cost is not great, 400 yen for a six weeks' trip from Tokyo and back should be more than sufficient to cover all expenses.

The country has to my mind another great charm, it has not yet been discovered by the "globe trotter," at least he is not *en evidence.* I doubt if some of the water I was fishing over had ever been fished over by a white man before. Many interesting and amusing experiences were encountered during the trip, but the scope and object of this article would be much overstepped if any attempt were made to relate them. A kodak would be a most useful addition to one's kit. I much regret not having taken one myself, a very interesting and permanent record of one's travels would thus have been obtained.

I should recommend anyone contemplating making this trip to read Bachelor's book on "The Ainus and their Folklore," where much interesting information will be found about these peculiar people; also Major Lavita's article on "Salmon Fishing," contained in the February number of the *Badminton Magazine* for 1910.

Reviews.

DICTIONARY OF MEDICAL DIAGNOSIS. By H. L. McKisack. Second Edition. London: Baillière, Tindall and Cox. 1912. Pp. X and 590. Price 10s. 6d. net.

This book provides a description of symptoms and their significance arranged in alphabetical order. It often occurs to us in the course of practice to hear of a symptom, or series of symptoms, for which we are at a loss to provide an explanation, and a reference to a book such as this is often the thing which is needed to put us on the right track.

Another use for the book is when, in the course of our reading, we come across a reference to such and such a sign, often very inconveniently labelled with a man's name. Dr. McKisack's book provides the necessary explanation in such a case. Lastly, it is not a bad practice periodically to renew our acquaintance with the text-book descriptions of signs and symptoms; even the most experienced and the most conscientious get rusty on some points, and the perusal of such a book as this, say, once a year, would serve to refresh our memory and keep our knowledge of clinical signs fresh. We have tested the book from these points of view, and find it fulfils its purpose admirably; reference to symptoms presented by recent cases, which had necessitated considerable reflection, showed that the work would have provided the necessary guidance.

We could hardly expect that such a work would provide a guide in tropical diseases, and in this department it is decidedly weak. It is a defect that is common to books written by men without tropical experience, and, if we might offer a suggestion, it is one which might be remedied with advantage, if only to serve in some degree to reduce the number of appalling mistakes which are made even by eminent men in this country when they come to deal with patients who have returned from tropical countries. We have only to cite in this connection the prevailing idea that unexplained fever in a man who has once lived in the tropics (it may be a dozen years back) is malaria; such an idea as this leads to people dying of unopened liver abscesses, or to patients who are suffering from phthisis, being dosed with quinine for months when sanatorium treatment was really indicated.

Apart from these criticisms, if criticisms they may be called, the book can be recommended as a very useful and very readable guide to the symptomatology of disease.

W. S. H.

UNITED SERVICE MAGAZINE, January, 1912.

This number contains several very interesting papers; and it may be remarked that back numbers of such magazines can generally be obtained from the circulating libraries at a small price.

Admiral Sir E. R. Fremantle writes on "The Morocco Crisis and Churchill's clean Sweep," and Lieutenant Dewar on "The Admiralty and the Autumn Crisis," both papers advocating a Naval War Staff, the creation, or evolution, of which has since been announced.

Admiral Fremantle believes the statement to be correct, that the military had their expeditionary force in readiness, but that they were suddenly confronted with a naval *non possumus*, as the Admiralty were not prepared to guarantee "safe passage" till they had dealt with the enemy's naval force, or had so located and blockaded it that there would be no danger of interference with transports, even by destroyers or submarines. He thinks that too great reliance on the supposed superiority of our Navy may have caused the military authorities to minimise the naval danger. But this want of appreciation of the naval position shows that the two services were not in touch with one another, and the necessity for a Naval War Staff. As to the latter Admiral Fremantle suggests that, "possibly Sir Arthur Wilson, a strong, self-reliant man, was reluctant to admit of any interference in what he considered to be the First Sea Lord's responsibility, and that he was supported by the other Naval Lords."

If this was their view it would afford the best explanation of a change in Naval Lords more drastic than any in recent years.

Lieutenant Dewar agrees with Admiral Fremantle as to what was probably the attitude of the Admiralty, but holds that the general staff were right in their request, that arrangements should be made for the instant transport of the military force. "Considering the topographical features of the coast and the short distance to be traversed, together with our unquestioned naval superiority, there was nothing to prevent the immediate passage of transports. The passage (it can hardly be called a voyage) would have taken place behind an easily defensible 21-mile start, commanded by naval ports on both sides. With a strong flotilla of destroyers and submarines in the Downs, and patrolling the Dutch narrows, the appearance of any battleships would have been signalled in ample time to permit transports to reach port." . . . "If the Admiralty refused to undertake this business, it must have based its refusal on one of two grounds. Either, firstly, that the enemy's fleet must be held up or destroyed before it could guarantee the safety of passage; or, secondly, that if all the regulars were despatched to France, the increased burden of coastal defence thrown on the fleet would handicap naval strategy." The first is a purely naval question; the second is one to be solved by the Cabinet or Committee of Imperial Defence, and should long ago have been tabled and hammered out by them.

These papers are followed by an important one by Lord Milner, "A Civilian View of National Service." He considers that the reasonable objections to National service may be reduced to two arguments. The first is that the geographical and other conditions of the British Empire are so exceptional, that what all other great countries have found necessary for their protection is not necessary for us. It may be put in the following form: "The command of the sea is vital alike to the maintenance of our Empire, and to the safety of these islands. As long as we retain that command military forces greater than those which we at present possess are unnecessary. If we lost that command, an army, even a great army, could not save us, for we should be cut off from our oversea possessions, and we should be liable to be starved at home." He thinks that this statement, though in a sense perfectly true, harbours a great fallacy—that the Navy alone can ensure command of the sea. We

cannot retain it by being prepared to build ships, and even more ships, to outstrip any possible rival. We may build against one nation or even against a combination, but we cannot build ships against the half of Europe. "If Western Europe, with all its ports, its harbours, its arsenals, and its resources, were to fall under the domination of a single will, no efforts of ours would be sufficient to retain command of the sea. It is the Balance of Power on the Continent which alone makes it possible for us to retain it. . . . But in order to help to maintain that balance we require an army, and no puny army. It need not be an army equal to that of one of the great military powers, but it must be an army which would weigh on the scales in a continental struggle, an army large enough to make our alliance valuable in a great land war. For that purpose all the regular troops which are at present available—the whole "Expeditionary Force"—are quite inadequate, though they would count for something." But under present conditions we should not be able to repair the wastage even of this small force for three months without a trained nation behind it. He holds that the main, if not the only cause of the prolongation of the South African war, was the fact that we so soon got to the end of our tether in respect of trained fighting men.

The second argument against National Service is that the burden which any system of general military training would involve is greater than the Nation can, in addition to other burdens, be reasonably asked to bear. In answer to this Lord Milner points out that we do not aim at military strength on the scale of Germany or France, but "we do need a nation of greatly improved physique, and of some general military training, a nation capable, under the strain of war, of developing a fighting strength three or four times as great as what we at present possess." He ventures to suggest that the first step should be taken by giving the whole of our able-bodied youth some six months' service (presumably whole-time) in the ranks of the Territorial Army, and by preparing them for that service by general cadet training at school.

"The experience of foreign countries shows that, when once a definite period of service is demanded of every man, of whatever class, within certain age limits, all social and industrial conditions adapt themselves to that requirement. . . . Whether the Territorial Army, sure of its members, and giving to its members in time of peace that substantial degree of training which is at present postponed till the outbreak of war, would be alone sufficient to fill the gap in our military organization, to give us all the additional strength that we need, is more than I am prepared to affirm, though on the other hand I must not be taken to deny it. Let us begin at any rate by erecting a genuine Territorial Army."

J. T. C.

HANDBOOK ON MILITARY SANITATION FOR REGIMENTAL OFFICERS. By Major K. B. Barnett, M.B., B.Ch., F.R.C.S.I., R.A.M.C. With an Introduction by Lieutenant-General Sir Horace L. Smith-Dorrien, K.C.B., D.S.O., A.D.C. London: Forster Groom & Co., Ltd. Pp. xxii. and 176. Price 2s. 6d. net.

On taking up a book on elementary hygiene, intended for the general reader, one is rather on the look out for evidence of the health faddist—extravagant laudation of the latest health craze or equally extravagant

condemnation of some not very deadly sins. Major Barnett has very successfully steered clear of these rocks. If he has skimmed rather lightly over the scientific factors in the cause and spread of infective diseases, he has included such of their practical applications as concern the regimental officer; sufficient to enable subaltern officers to pass their examination in this subject; and this is presumably the primary object of the book.

It is admittedly difficult to present technical details to non-technical readers, while maintaining strict scientific accuracy, but we think in one or two instances the author has allowed himself too wide a licence. It is, for instance, misleading to state that the micro-organisms of disease belonging both to the vegetable and animal kingdoms are spoken of collectively as *Bacteria*, and that those belonging to the animal kingdom are called *Amœba*. Diphtheria antitoxin is, of course, not obtained by inoculating a horse "with the germs of human diphtheria"; nor is small-pox vaccine ordinarily prepared by first vaccinating a calf "with human small-pox." Until recently this was thought to be impossible and though, we believe, it has been done to a limited extent in Germany, it is certainly not done in England, nor are British troops ever vaccinated with such vaccine.

The statement that in cholera and dysentery the urine is "infectious" can hardly be supported by bacteriological knowledge, since in cholera only in a few instances and in dysentery, as far as we know, never has the causal organism been isolated from the urine.

That yellow fever "is caused by the infection of the blood by a minute animal germ" is hardly yet an established fact, for the claim of Seidelin that the "yellow fever bodies," described by him and named *Paraplasma flavigenum*, are the cause still requires confirmation.

The figures given for the losses from disease in the South African war differ somewhat widely from those in the "Medical History" of the war by Lieutenant-Colonel Simpson, which may be accepted as the official data.

The numerous references to the official books of Regulations are a useful feature of the book, and a number of examination papers set in the subject (j) for the promotion of lieutenants is given at the end of the book.

Current Literature.

Yellow Fever Bulletin, Vol. I., No. 8 (Abstract).—The editor refers to the theory of permanent endemicity as an explanation of outbreaks of yellow fever which arise without introduction from without; he quotes a letter from Dr. Liceago, of Mexico, who suggests, as an alternative explanation, that there may be animals which are susceptible to the yellow fever parasite, and that infection may be kept going in them.

A report of Stephens' contribution to the discussion on yellow fever at the British Medical Association is reproduced. Stephens points out

that Boyce's position was much misunderstood, and that there was a general impression that when he asserted that yellow fever was endemic in West Africa, he meant that it was raging there. This was not Boyce's meaning. The more yellow fever was endemic, the less likelihood there was of raging epidemics, because of the constantly large proportion of immunes in the population. He urged the segregation of Europeans from natives, both on account of yellow fever and of malaria.

Seidelin also supported the view that natives were immune because of repeated mild attacks, and that epidemics arose when a number of non-immunes were introduced into a population where yellow fever was quietly endemic. He quoted an outbreak in his own family in Yucatan; his wife and two children had a mild attack of fever, he had a more severe one, and in his case the diagnosis was yellow fever, the other cases which occurred at the same time passed undiagnosed.

W. S. H.

Sanitary Conference, Bombay, 1911. Second Day's Meeting. (Abstracted from *The Times of India*, Mail Edition, November 18, 1911).—Major Glen Liston, when reading a paper on plague, said that one pair of rats kept in a laboratory can in the course of a single year multiply to fifty pairs. Owing to food supply and other considerations it must not be assumed that a similar rate of increase takes place among rats living under natural conditions; still, any attempt to exterminate the rat population of a district must be a task of very considerable magnitude. He advocated limiting the food supply of rats by making houses, markets and grain go-downs rat-proof, and by removing all collections of garbage.

A damp, cold weather is more favourable for the propagation of rat fleas than a dry, cold weather, hence severe epidemics of plague are more likely to occur when the cold weather is damp.

An important point determined experimentally by Major Glen Liston is that during the course of a series of plague epidemics a race of rats is evolved which is naturally immune to plague. Thus a large proportion of rats from plague-stricken cities like Bombay are immune to small doses of an infected rat's spleen, but rats from plague-free places, e.g., Madras, readily succumb to these doses. The young of these immune rats are almost as immune as their parents. This factor probably explains the gradual disappearance of plague in an infected country; many years would, however, have to elapse before plague disappeared from India as a result of this process.

C. E. P.

Yaws.—" Reports by the Surgeon-General and the Medical Officer of St. Joseph on the use of 'Salvarsan' (606) in the treatment of Yaws at the St. Augustine Yaws Hospital, Trinidad.

" *Report on 500 cases of Yaws treated with 'Salvarsan'* (606) *at St. Augustine Yaws Hospital, Trinidad.*—I am able to give the results of the treatment of 500 cases of Frambœsia with '606' at the St. Augustine Yaws Hospital, Trinidad, from January to October this year. Only intramuscular injections were used, and the usual dose was 9 gr. (0·6 grm) for an adult.

" The 500 cases were injected as follows:—

January	20
February	1
March	14
April	87
May	68
June	75
July	101
August	17
September	87
October	30
Total	500

"The first case was injected on January 4, and the 500th case on October 14. The injections were made by Drs. Rost, Cleaver and myself.

"I write this on November 30, so six weeks and six days have elapsed since the 500th case was injected.

"*Results.*—Four hundred and ninety-eight cases are cured, that is 99·6 per cent; 409 cases were cured with one injection, or 82 per cent; 75 cases were cured after receiving a second injection: 14 cases were cured after receiving a third injection. The total number of injections was 603.

"*Stubborn Cases.*—Two of the cases are not yet cured. S. C., aged 7, male, injected on September 16. I re-injected him on the 11th instant. T. M., aged 14, male, injected on October 2. I re-injected him on the 8th instant. Both cases show amelioration. Each will be given a third injection next week, and if this cures them we will get 100 per cent of cures.

"*Relapses.*—There were five relapses—1 per cent. Before salvarsan was used, relapses were 12 to 14 per cent. Relapses are quickly cured by a second injection.

"*Complications.*—When Dr. Cleaver was acting for me four deaths occurred among cases that had been injected by him. Dr. Cleaver is of opinion that none of the deaths were the result of the injections with salvarsan. No local gangrene, no nerve or ear complications, and no dimness of sight occurred in any case. The only complication was the formation of a simple abscess at the seat of injection in two cases, that is one abscess for every 301 injections.

"*Conclusions.*—Salvarsan is a specific for yaws, and there is no danger attending its use for this disease. The tropics are under a debt of gratitude to Professor Ehrlich for his discovery of salvarsan.

"(Signed) HENRY ALSTON.

"*November* 30, 1911. "*Medical Superintendent.*

"*Supplementary Report on 500 Cases of Yaws Treated with 'Salvarsan'* (606).—The two stubborn cases of yaws are now cured, only one required a third injection of salvarsan.

"HENRY ALSTON,

"*December* 15, 1911. "*Medical Superintendent.*"

Reinfection with Syphilis.—Schueller (*Berlin. klin. Woch.*, No. 4 1912) reports two interesting cases observed in Gennerich's clinic at Kiel. The first case was infected on November 11, 1910, and admitted

to hospital twenty-eight days after, with an indurated ulcer on the lower lip; numerous spirochætes were found in the ulcer. Treatment was begun with four injections of calomel after which he received five injections containing a total of 1·95 grm. salvarsan. Nine months after completion of treatment there were no signs of syphilis, and his serum reaction was negative. Two months later he was readmitted with a typical hard sore on the foreskin in which spirochætes were plentiful.

The second case was admitted, ten days after infection, with a sore on the sulcus; spirochætes were found in the expressed serum; the serum reaction was negative. He received four calomel injections and three of salvarsan containing a total of 1·4 grm. Three months after the date of infection his serum reaction was negative. A month later he exposed himself to reinfection; four days afterwards he was readmitted with an indurated sore on the penis partly occupying the site of the previous sore; spirochætes were present. The second sore in this case was regarded as a "chancre redux" set up by mechanical irritation of a focus of latent spirochætes. This patient presented a mild idiosyncrasy to salvarsan, the earlier injections producing a condition of malaise and slight albuminuria. Schueller remarks that when salvarsan is injected into an untreated case of syphilis it is almost always followed by pyrexia, whereas if salvarsan is withheld till six to eight injections of calomel have been given, no rise of temperature takes place.

C. E. P.

Salvarsan and the Eye.—Dr. Cohen (*Berlin. klin. Woch.*, No. 49, 1911) reported two cases in which an injection of salvarsan was followed by serious eye trouble. The first case was that of a woman aged 39, who had apparently contracted an extra-genital chancre in October, 1910; this was followed by a well-marked papular eruption. On January 21, 1911, 0·5 grm. of salvarsan was injected intramuscularly and all symptoms rapidly cleared up. During the next two months the patient appeared to be perfectly well. At the beginning of April the right eye suddenly became acutely inflamed. On examination optic neuritis was found to be present, and the field of vision was reduced to one half. Soon after, the left eye became affected, but not so severely as the right one. Under local treatment, mercurial inunctions and iodide of potassium, both eyes slowly improved up to June 26, when there was a relapse. By September the condition of the eye had become serious. Injections of gray oil were tried, but did not produce any improvement. One of the most marked symptoms of the case was a central scotoma for blue and green. In spite of treatment the right eye steadily became worse, and vision was almost entirely lost. Cohen considers that the trouble was due to salvarsan and not to syphilis, as a syphilitic neuro-retinitis rarely runs such a prolonged and unfavourable course, and a persistent central scotoma points to optic nerve intoxication, not to a syphilitic affection.

The second patient had been under treatment for constitutional syphilis for three years, and was suffering from syphilitic iritis when she received an intravenous injection of 0·3 grm. of salvarsan on March 10, 1911. As no improvement followed, an injection of 0·4 grm. was given on two subsequent occasions at intervals of ten days. The condition of the eye at once became much worse, and a central scotoma

for blue and green was noted. Under local treatment the symptoms cleared up, and by the end of June vision had returned to normal.

C. E. P.

Treatment of Acute and Chronic Gonorrhœa. — Oberstabsarzt Professor Dr. Menzler (*Münch. med. Woch.*, No. 46, 1911), in a long article, advocates the treatment of all cases of gonorrhœa by means of injections of gonococcic vaccine. Menzler refers to the unsatisfactory results obtained by the usual methods of treatment, and states that an injection of gonococcic vaccine will cause a reaction if there is any latent nest of gonococci in any part of the body. He does not agree with Bruck's view that a gonococcal infection of the urethral mucous membrane is not influenced by an injection of gonococcic vaccine.

Menzler advocates the following treatment in every case of gonorrhœa: For the first two to three weeks he prescribes absolute rest in bed with a non-irritating diet and large quantities of demulcent drinks, but no urethral medication of any kind. On the first day of treatment he gives the patient an injection of vaccine containing 5 million gonococci; this is repeated every third or fourth day. When the acute symptoms have subsided, Menzler orders the patient to sit in a hot hip bath at a temperature of 105° F. for fifteen to twenty minutes twice daily.

During the first two weeks each injection of vaccine is followed by an increase in the amount of discharge, and of the turbidity of the urine. In uncomplicated cases all the symptoms clear up, and injections of vaccine produce no effect in from twenty-five to thirty days. The average duration of treatment in twelve cases, some of which had complications, was forty-seven days. One case developed epididymitis while under treatment.

Menzler condemns treatment by urethral injections, and especially objects to those proprietary preparations the main claim of which is that they cause a speedy disappearance of the urethral discharge.

C. E. P.

The Early Treatment of Gonorrhœa.—Spitzer (*Wien. med. Woch.* No. 49, 1911) discusses the value of early treatment in gonorrhœa. He first shows that an uncomplicated case of gonorrhœa usually requires six to eight weeks' treatment before it can be looked on as cured. He then enumerates a long list of remedies which have been employed in the "abortive" treatment of gonorrhœa, and gives a list of authorities with the percentage of successes claimed by each in this form of treatment.

An important point which has not yet been decided is up to what time after the date of infection is it worth while trying to cut short the disease by vigorous local treatment. Spitzer has had successes in cases in which a week had elapsed since the infection took place; as a general rule, he considers that to be successful the treatment should be begun as soon as a sensation of tickling in the urethra is noticed by a man who has exposed himself to infection. Spitzer uses protargol 5 per cent, icthargan ½ per cent or nitrate of silver, ¼ to ½ per cent, solution. The injection is repeated after six, twelve, or twenty-four hours, according to the amount of irrita-

tion caused by it. The gonococci disappear from the secretion about the second day; weaker solutions are used from the second to the fifth day when treatment is omitted.

C. E. P.

Treatment of Heat Stroke.—Medécin-Major Albouze (*Le Caducée*, December 2, 1911) reported a case of heat stroke successfully treated by mechanical stimulation. The patient, a strong healthy man in his second year of service, was taking part in the annual manœuvres held during the autumn of 1911, and had just completed a march of 26 kms. in full marching order, when he asked for permission to fall out, but almost immediately sank to the ground in an unconscious condition. His comrades at once removed his equipment, opened his clothing and poured cold water on his head. A medical officer injected ether and caffeine subcutaneously, but without apparent benefit. The pulse could scarcely be felt, his respirations were shallow and the extremities cold. Cold water was repeatedly poured over the man, and another similar injection given, but without any appreciable benefit. A handkerchief was moistened in water, and the precordial area smartly flicked with this. After twenty minutes of this treatment the pulse and respirations had greatly improved, and the medical officers being tired stopped for a few minutes' rest. The pulse at once began to fail; on the stimulation being recommenced the pulse again improved. After another half hour of this treatment the pulse became full and strong, and the patient regained consciousness.

C. E. P.

Prophylaxis of Malaria.—Treutlein (*Arch. f. Schiffs u. Tropen-Hyg.* Bd. xv. Heft 23, 1911) discusses the relative value of quinine and mechanical protection against mosquito bites in the prophylaxis of malaria. He comes to the conclusion that quinine prophylaxis is not to be relied on. In support of this view he gives his own experience and quotes that of several others. Thus Zupitza, in German East and West Africa, regularly took quinine, but suffered from three attacks of malaria. He then abandoned quinine prophylaxis and adopted a rigid system of mechanical protection. In addition to making his house mosquito-proof, he wore high boots, high collars which fitted closely to the back of the neck, a head veil and gloves made of gauze stretched over a wire frame. Treutlein followed a similar plan, and during two years exposure to infection, did not suffer from a single attack of malaria.

He quotes the experience of a battalion of the Bolivian army which was sent to the malarious districts of the Amazon in 1909, and relied entirely on quinine prophylaxis. In a few weeks one half of the men were attacked with malaria and unfit for duty.

Treutlein also thinks that full doses of quinine are injurious to the white blood corpuscles of a healthy person. He quotes several opinions in support of this, and gives details of some experiments which he made to investigate this question. Blood smears were taken from three normal individuals, before and after meals; these were fixed and stained by Giemsa's method. Each of these persons then received a dose of quinine as if for prophylaxis of malaria; three and twenty-four hours after the administration of the quinine, blood smears were taken and stained in the same way as the first ones. In the smears prepared after the quinine

was given, the nuclei of the polymorphonuclear corpuscles were uneven in outline, torn and irregularly stained, making a sharp contrast to those in the smears taken before the quinine was given.

In persons suffering from malaria, and treated with quinine, the polymorphonuclear corpuscles were not affected, the quinine apparently having a greater affinity for the parasites than for the white corpuscles.

C. E. P.

Preparation of Dressings for Use in the Field.—A. O., No. 992, June, 1911 (*Deutsch. Militär. Zeit.*, November 20, 1911), states that: Investigations carried out during several years have shown that the preparation of dressings with perchloride of mercury does not possess the advantages which were hoped for at first. No satisfactory substitute for the perchloride of mercury has yet been found. Dressings sterilized with steam alone remain sterile when stored in packages. The Advisory Committee has now recommended that no antiseptic be employed in the preparation of field dressings. In future all dressings will merely be sterilized with steam.

C. E. P.

Care of Rubber Gloves in Field Medical Units.—A. O., No. 1807, October, 1911 (*Deutsch. Militär. Zeit.*, November 20, 1911), gives the following directions:—

(1) The inside of the glove is to be thoroughly dusted with powdered talc.

(2) Strips of gauze about 1 in. wide and 12 in. long, are to be inserted into the fingers.

(3) The gloves are then to be enclosed in paper, a large sheet being folded so that each glove lies in a separate compartment; the ends of the paper are folded over to make a packet.

(4) The gloves folded in this way are exposed for thirty to forty minutes to current steam. The paper is not to be opened till the gloves are required for use.

(5) When about to be put on the gloves are to be held in their paper covering while the gauze is being withdrawn.

(6) After use the gloves are to be washed in tepid water with soap; they are to be filled with water to detect any punctures.

(7) On mobilization sterilized gloves will be issued in black envelopes; each envelope contains five pairs of gloves separately wrapped in sterilized paper. C. E. P.

Correspondence.

TREATMENT OF KALA-AZAR

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In reading Sir William Leishman's Review of Kala-Azar and Tropical Sore in the February number of the Journal, I notice that he makes no mention of the effect of the application of X-rays in the treatment of tropical sore. While at Rawal Pindi in 1908, a kalassi of the 36th Sikhs came to me with a sore the size of a rupee on the dorsum of his hand. It had been diagnosed clinically as a Delhi sore, and had the typical appearance of one, though I regret that a search for *L. tropica* was not made. Under various methods of treatment with lotions and ointments no improvement was apparent, so I decided to try the effect of the X-rays. After three exposures the sore took on a more healthy appearance, while after seven exposures in all it had completely healed, leaving a particularly neat and unobtrusive scar. Six months later this same man died of cholera and I was able to assure myself that there had been no recurrence.

I was so struck with the success of X-rays in this one case that I think it is possibly worthy of notice.

I am, &c.,
P. G. EASTON,
Capt. R.A.M.C.

South Farnboro',
March 2, 1912.

A QUESTION OF WORDS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Why, I most respectfully ask, does "Senior" strain at the poor gnat anŏpheles and make no mention of the herd of verbal camels that we all swallow daily?

(By the way, it should be "strain *out* the gnat," I believe, if we are to be meticulous Grecians.)

To take only a few words that spring at once to mind—what about sĕptic for sēptic, opsōnic for opsōnic, rādius for rădius, and fībula for fibula? While the shade of Carey alone knows whither Calliope would have flown had Horace invoked her: "Descende coelo et dic age *tībia*."

Furthermore, where in "Senior's" esteem comes the huge army of words that march under the sign of the bar sinister? Is there no handkerchief for his nostrils when, betwixt the wind and his nobility, stalk Appendicitis and his brother Appendicectomy, Monocular and Rectocele, and all the shameless cohorts of Græco-Romish bastardy?

The fact is, sir, that we are too far gone in decay to recover. We have descended easily into Avernus and now we cannot withdraw our feet. We have long ago become a byword and a hissing among the schoolmasters, and we do not apparently care.

Of a famous grammarian Browning tells us that :—

> He settled *Hoti's* business—let it be!—
> Properly based *Oun*—
> Gave us the doctrine of the enclitic *De*,
> Dead from the waist down.

Now we of this generation hold the business of *Hoti* and the base of *Oun* in contempt; while for the enclitic *De* we do not care an emphatic D; but our interest focuses on the fact that the grammarian was dead from the waist down; and we wonder if we could have done anything to help his pitiable *tussis* and *calculus*.

I, for one, hold that this attitude of mind is not without justification.

I am, &c.,

Spike Island,
February 21, 1912.

V. T. CARRUTHERS,
Capt. R.A.M.C.

No. 5. May, 1912. Vol. XVIII.

J. T. Fotheringham
Lt Col

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL W. H. HORROCKS,

ROYAL ARMY MEDICAL CORPS

ASSISTED BY

MAJOR C. E. POLLOCK

ROYAL ARMY MEDICAL CORPS

ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, Ltd.

OXFORD HOUSE,

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

from the usual hyaline leucocytes, not only in their greater size but in the character and position of the nucleus and in the staining of the protoplasm. As regards the first of these points, the appearance of the nucleus, this but rarely showed any tendency to lateral indentation or to the horse-shoe appearance common in hyaline leucocytes, and, more often than not, it was situated excentrically and even pressed up against the side, while occasionally it extended completely across the cell. To save a more lengthy description a glance at the plate will show some of the types encountered and figs. 2, 4, 5, 6, 7, 9, 10, 14 and 15 demonstrate this particular feature. It is also noteworthy that the nuclear contours were always quite sharp and well defined, and that there was no evidence of any degenerative change of the nature of karyolysis or karyorrhexis; the nuclei stained well, though in different degrees of depth according to the looseness or otherwise of the nuclear network.

The protoplasm of these cells stained a pale blue but did not exhibit the transparent appearance so distinctive of the hyaline leucocytes; it also frequently showed a reticular appearance more suggestive of the protoplasm of tissue-cells than that of leucocytes.

In the majority of instances the protoplasm was devoid of granules, but minute granules were found in a few, in very varying numbers and most unevenly distributed throughout the cell. As far as could be judged from the stain employed, that of the writer, these resembled the neutrophile granules of the ordinary polynuclear leucocyte or the neutrophile myelocyte, except that they seemed smaller and, in some cells, were of a pinker hue than the latter. The possibility of their being of another nature will be dealt with later.

I cannot speak with certainty as to the true nature and origin of these cells, but for various reasons I am inclined to regard them as endothelial cells which have been disrupted from the walls of the blood-vessels or lymphatics, and have been washed into the circulating blood. They appeared to resemble very closely the endothelial cells which are found free in the spleen, and in the capillaries of the liver in cases of kala-azar and which, in that disease, are more or less heavily infected with the characteristic parasites. I have not myself encountered them before in films of blood from blackwater cases, but similar cells have been noted and carefully described by Christophers and Bentley[1] in the blood of the cases which they

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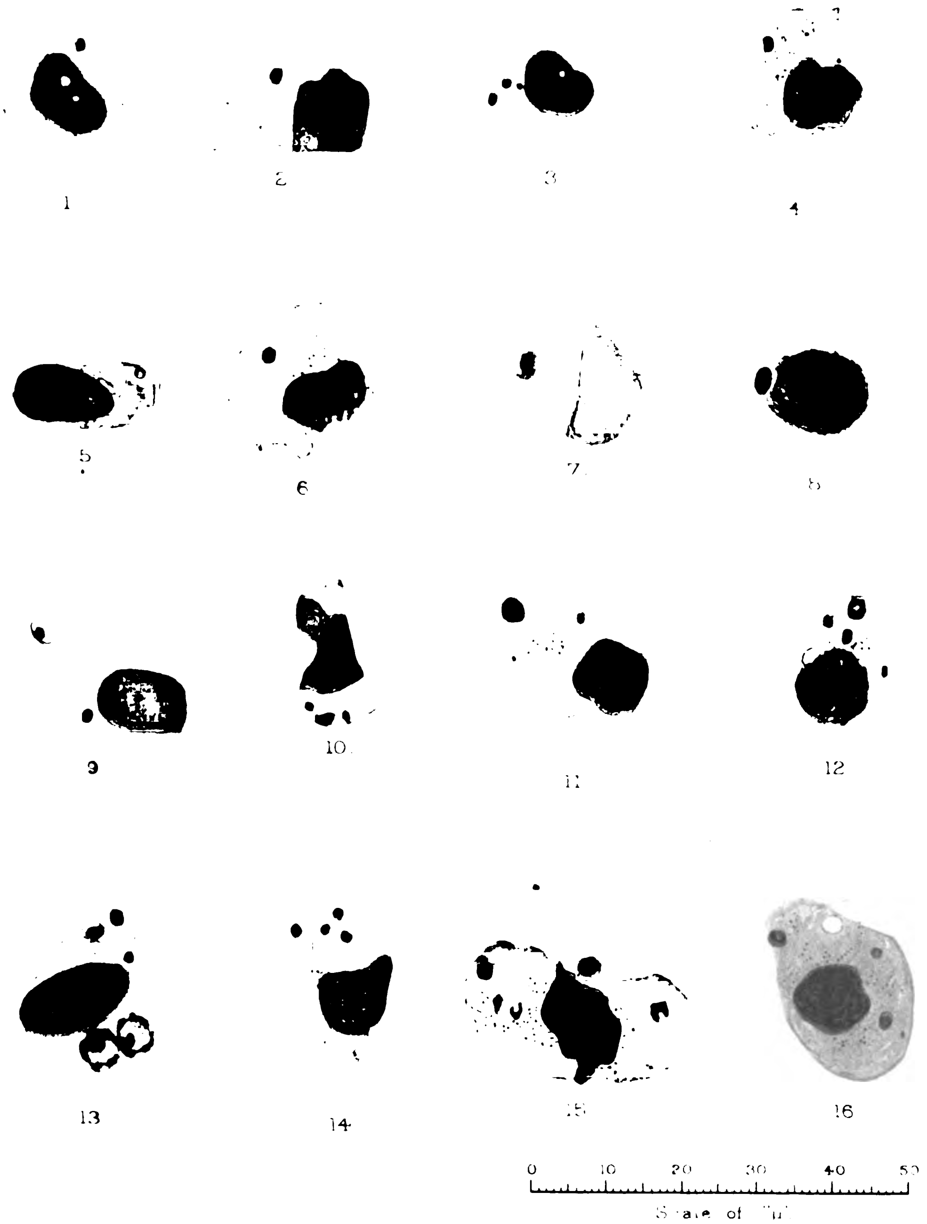
[1] S. R. Christophers and C. A. Bentley, "Blackwater Fever," Sci. Memoirs, Officers of Med. and San. Dept., Gov. of India. No. 35, 1908.



To illustrate "Cell Inclusions in the Blood of a Case of Blackwater Fever."

By Lieut.-Col. Sir William B. Leishman, F.R.S., R.A.M.C.

VOLUME XVIII. MAY, 1912. No. 5.

Journal of the Royal Army Medical Corps.

Original Communications.

CELL-INCLUSIONS IN THE BLOOD OF A CASE OF BLACKWATER FEVER.

By Lieutenant-Colonel Sir WILLIAM B. LEISHMAN, F.R.S.
Royal Army Medical Corps.

Our knowledge of the ætiology of blackwater fever is still far from clear, in spite of the numerous laborious and careful researches which have been carried out in connexion with cases occurring in all parts of the Tropics; it appears therefore worth while to put on record the following observation. There is but slight ground for assuming that the bodies described below have any causative connexion with the disease, but others, more favourably situated as regards clinical material, may possibly be led to look for them and to follow up a line of investigation which might, conceivably, throw light on the dark places in our knowledge of this disease.

The material on which this note is founded is admittedly of the scantiest nature, as it consisted only of three unstained blood-films from a case of blackwater fever which occurred in Uganda, and which were sent to me by the Principal Medical Officer, Dr. A. D. P. Hodges, to whom I would here express my warm thanks. No clinical details were furnished, but such have been asked for and, if they should throw any useful light on the matter, will form the subject of a further note.

On first glancing at the stained films I was struck with an abnormal feature in the shape of the presence, in large numbers, of cells of an unusual type. These cells displayed considerable variations in shape and were of exceptional size, the average diameter being about 25 microns. They were of mononuclear type but differed

from the usual hyaline leucocytes, not only in their greater size but in the character and position of the nucleus and in the staining of the protoplasm. As regards the first of these points, the appearance of the nucleus, this but rarely showed any tendency to lateral indentation or to the horse-shoe appearance common in hyaline leucocytes, and, more often than not, it was situated excentrically and even pressed up against the side, while occasionally it extended completely across the cell. To save a more lengthy description a glance at the plate will show some of the types encountered and figs. 2, 4, 5, 6, 7, 9, 10, 14 and 15 demonstrate this particular feature. It is also noteworthy that the nuclear contours were always quite sharp and well defined, and that there was no evidence of any degenerative change of the nature of karyolysis or karyorrhexis; the nuclei stained well, though in different degrees of depth according to the looseness or otherwise of the nuclear network.

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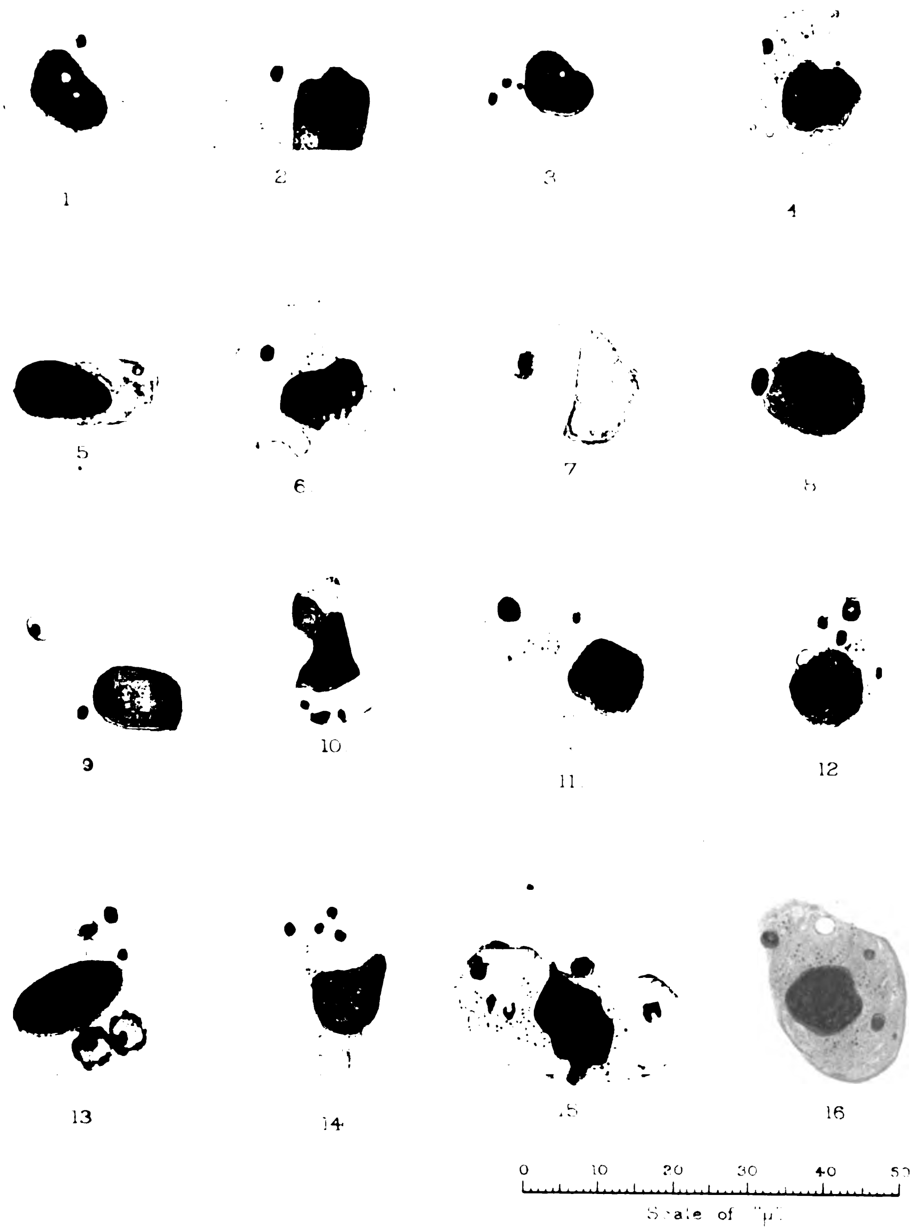

To illustrate "Cell-Inclusions in the Blood of a Case of Blackwater Fever."

By Lieut.-Col. Sir William B. Leishman, F.R.S., R.A.M.C.

investigated in India, and they, too, regard them as endothelial in origin.

No information is available as to the actual number of leucocytes present in the blood, but, to judge from the films, a moderate degree of leucocytosis must have been present.

The relative proportions of the various cells were as follows :—

Polynuclears	41·5 per cent.
Lymphocytes	6·0 ,,
Hyalines	4·5 ,,
Eosinophiles	0·5 ,,
Mast cells	0·5 ,,
Transitionals	8·5 ,,
Neutrophile myelocytes	2·5 ,,
Turk's cells	2·5 ,,
Endothelial (?) cells	33·5 ,,

A few normoblasts were found and, in one of the three films, an undoubted megaloblast. No striking changes were manifest in the red cells, which stained evenly and well and exhibited no evident deficiency of hæmoglobin ; basophilia was not seen and there were no poikilocytes or cells of exceptionally large or small size.

Careful search was made for malarial parasites, always a point of interest in view of the widely held views as to the connexion of malaria and blackwater, but none were found. At the same time, three or four pigmented leucocytes were found containing clumps of what appeared to be melanin, so it seems probable that parasites were either present or that the patient had very recently suffered from an attack of malaria.

Turning now to the cell-inclusions which are the chief feature of interest of this blood, these were altogether confined to the large endothelial cells. They were far from numerous, only about one cell out of twenty containing them, but they could hardly have been missed as they formed very clear and arresting features. It is not possible to say whether they would have been made manifest by the customary five minutes' application of the writer's stain, since each film was stained deeply by half an hour's contact with the mixed stain and water. By employing the stain in this fashion and subsequently washing the film with 60 per cent. alcohol, every trace of deposit left by the stain is dissolved off; this is essential for bringing out the details of fine structure and has the further advantage that we can be certain that we are not dealing with artefacts due to the deposition of stain.

In all cases the inclusions were seen to be contained in the

cell protoplasm, none were seen on or in the nuclei and only rarely were they seen in close contact with the nuclear membrane.

A lengthy description of the bodies may be dispensed with by referring to the coloured plate. The sixteen cells there depicted include more than half of the total number of cells in the three slides which were found to harbour inclusions. It will be seen that the inclusions range in size from a diameter of 1 to 5 microns, that they show a definite tendency to the circular in contour and that, while the majority present themselves under the aspect of ring forms, with deep-staining periphery and fainter hued centre, the smaller forms are homogeneous in their colouring. In all cases the inclusions took on a more or less pronounced pink or red colour, while many, as will be seen, showed the deep red reaction usually attributed to chromatin.

The two large inclusions seen in fig. 13 were remarkable in appearance and showed a dark-staining centre and an irregular but very deeply stained membrane or capsule; one other inclusion of the same type was found in another cell which is not figured as it was accidentally destroyed by a scratch before it could be sketched.

In several of the cells containing the inclusions well defined vacuoles of varying size were seen in the protoplasm, and since some of the smaller inclusions were found to be lying in similar clear areas, as for instance in figs. 9 and 13, it is not improbable that the empty vacuoles originally held similar bodies and that such vacuoles were not signs of degeneration of which indeed there was no other evidence in the cells in question.

The remaining feature of the sketches to which attention may be directed is the occurrence of fine granules in some of the cells; these have already been alluded to, and examples are afforded by figs. 4, 6, 11, 12, 15, and 16. It will be seen that they are extremely minute, but naturally it was not possible to depict them with any very precise regard to their real dimensions; they approached in many cases the limit of visibility, which is considered to approximate 0·1 micron.

The Possible Nature of the Cell-Inclusions.

It will be evident that these must fall under one of the following categories: (1) Artefacts; (2) products derived from changes in the nuclei or cytoplasm of the cells; (3) material which has been phagocyted by the cells; (4) micro-organisms. Each of these will be considered in turn.

(1) *Artefacts.*—The method of staining employed has already been mentioned, and it may safely be asserted that the inclusions were not derived from deposit or other change induced by the staining fluid. The writer's experience in connexion with this method enables him to speak with confidence on this point. Neither does it seem possible that the inclusions are artefacts due to fragments of foreign matter which had settled on or under the cells; the films were well made and free from dirt, and careful focusing showed that the bodies were actually inside the protoplasm of the cells, and were not lying either on or below them.

(2) *Products of Nuclear or Protoplasmic Change.*—It has been mentioned earlier that the nuclei of the cells appeared perfectly normal, and showed no signs of any degenerative change, such as karyolysis or karyorrhexis; their contours were always perfectly sharp. It seems, then, improbable they should have been extruded from the nuclei. At the same time it is possible that they may have had such an origin, in spite of the nuclei showing no direct evidence of this at the time the samples were taken. The appearance and staining reactions of the inclusions did not recall to me any products of nuclear change such as I have frequently encountered in other conditions. The possibility that they were products of changes, metabolic or other, in the cell cytoplasm also appeared unlikely, although this, too, cannot be absolutely excluded.

(3) *Phagocyted Material.*—The most likely objects to be taken into cells which are endowed with the property of phagocytosis are foreign particles of any sort, whether of organic or inorganic nature, and other cells. As regards the former the commonest material which is phagocyted in cases of chronic malarial infection, such as form the large majority of cases of blackwater fever, would be malarial pigment; as already mentioned, such pigment was found in leucocytes in this blood, but none in any other type of cell. Other extraneous matter was not in evidence outside the cells, and the inclusions noted in the endothelial cells appeared too regular in shape and structure to be regarded as of this nature. A more obvious explanation in this disease would be that the inclusions were only altered red cells, since phagocytosis of red cells is well known to be a striking feature in blackwater, although by no means limited to this disease. The most careful study of this feature of the disease, as far as I am aware, is that of Christophers and Bentley, already alluded to. These investigators record the

frequency with which the various cells of the blood and spleen exhibit the phenomenon and describe the various appearances which the ingested cells may assume. Among others, they describe the phagocytosis of red cells by the endothelial cells which are in question in this instance. Such cells they have found frequently in the blood during the acute stage of the disease, although the cells disappear rapidly when the hæmoglobinuria is passing off, and in many of them they observed evidences of phagocytosis of red corpuscles. Unfortunately their description was unaccompanied by plates or sketches, so it is not easy to contrast what they found with the cell-inclusions in this case, and I can only express my opinion that the inclusions are not to be accounted for in this manner. I am quite familiar with the appearance and staining reactions of phagocyted red cells in various stages of intra-cellular disintegration, but I have never observed them to take such an appearance as is to be seen in the accompanying plate.

A further observation is recorded by Christophers and Bentley, in which they noted in the blood of one of their cases on the fourth day of the disease a number of small mononuclear cells which had a deeply staining mass of nuclear-like substance lying within the protoplasm near the periphery of the cell; these bodies were small, averaging 1 to 2 microns in diameter, and they were inclined to regard them as nuclear extrusions. They also mention, in the case of large macrophages found in the spleen, that, among other inclusions such as red cells and pigment, some showed particles of a substance staining like chromatin, and somewhat resembling blood-plates. They had, however, observed these particles in other diseases than blackwater and were not inclined to attribute any special importance to them. Again, one may regret the absence of sketches, since it appears from the description that these latter bodies might perhaps have been similar to those found in the present instance. However that may be, the writer at all events has not observed them in specimens of splenic blood from any other disease.

(4) *Micro-organisms.*—Of these, bacteria may, I think, be safely excluded, at all events the inclusions do not bear the slightest resemblance to any known organisms of this nature. Blastomycetes might appear a more probable explanation, especially in connexion with the large forms shown in fig. 13, but the smaller bodies do not resemble any stage of the growth or multiplication of this class of micro-organisms.

As regards protozoa, at first sight these would appear to be even

more definitely excluded than bacteria were it not for the recent information which has come to light as to the probable life-history of the class of organisms to which Prowazek has given the name Chlamydozoa, and which he considers to be referable to the protozoa. The possible bearing of this information on the inclusions will be considered below.

The above short analysis of the various possibilities will at least show how numerous are the difficulties of ascertaining the true nature of the inclusions and how unjustifiable it would be to make any dogmatic assertions as to their origin. It appears to me, however, as at least possible that the inclusions in question may be due to the presence within these endothelial cells of Chlamydozoa. It need hardly be added that, even if this should prove correct, it would be a very long step between that knowledge and the proof that there was any causal relationship between these organisms and blackwater fever. Be that as it may, it would at least be an observation of considerable interest that organisms of this class should be present in this mysterious disease.

Since knowledge relating to the Chlamydozoa is not yet widely diffused—indeed the name itself is probably unknown to many—it may not be inappropriate to include in this note a brief outline of the present state of the subject in order that the reasons for my suggestion may be more readily followed. Apart from this, much of the work in question suggests developments of the greatest importance in the near future in connexion with the causation of some of the most dangerous diseases of man, and has thus an interest of its own.

The organisms to which this name was applied by Prowazek, in 1907, have in most instances two features in common: they are capable of passing through the usual bacterial filter candles, at all events such as are fine enough in their grain to keep back the smallest known bacteria, and, second, in the diseases in which they occur "cell-inclusions" have been noted as a constant feature. Prowazek's original list included the following diseases: small-pox and vaccinia, rabies, trachoma, molluscum contagiosum, contagious epithelioma of birds, foot-and-mouth disease, and certain diseases of fish, dogs and silkworms. Since then Prowazek has modified this list and, according to Hartmann, who gives a good summary of the subject,[1] would only definitely include variola and vaccinia, trachoma, molluscum contagiosum and bird epithelioma. Evidence

[1] HARTMANN: *Beilage. z. Centr. f. Bakt.—Referate*, vol. xlvii., p. 94, 1910.

about the remaining ones he considers too incomplete to permit of their being retained in the same class at the present moment. In addition, however, to the above list it appears far from improbable that such diseases as scarlet fever, measles, chicken-pox, rabies and perhaps yellow fever may eventually be shown to be due to viruses of a similar class.

The longest known of the cell-inclusions are those found in molluscum contagiosum, but those associated with variola and rabies are more widely known and are, respectively, named after their discoverers, "Guarnieri's bodies" and "Negri bodies." When first found and described they were taken to be the actual parasites of the respective diseases in which they occurred, and various generic and specific names were attached to them, which it is unnecessary to recapitulate. Although demanding in most cases special staining methods for their demonstration, these inclusions were not difficult to find and recognize and, in spite of some reports to the contrary, it was soon recognized that they were specific to the diseases in which they were found. At the same time, there was much that was puzzling in their morphology and in their distribution in the tissue-cells; for instance, Negri bodies were chiefly found in the grey matter of the cornu Ammonis and the cerebrum and in Pürkinje's cells of the cerebellum, while they were found to be scanty or absent in other parts of the nervous system which experiment had shown to contain the virus of rabies in concentrated form. Again, Negri bodies are constantly found in rabic animals, in what is known as the "virus des rues," while they are as constantly absent in the nervous system of animals infected with "virus fixe." Another fact which seemed inexplicable in view of the large size of the inclusions was that, in practically all the diseases enumerated above, the virus has been shown to be capable of passing through very fine filter candles, the filtrate, cell and germ free, proving as virulent for animals as the unfiltered tissue products.

The non-parasitic nature of the inclusions appeared to be finally established when it was shown that Guarnieri's bodies of variola were soluble in strong saline solutions, and were broken up by both peptic and tryptic digestion. The inclusions then came to be looked upon as mere products of cellular reaction in response to the influence of the still unseen and unknown virus. They were, however, still looked upon as specific in the sense that they were only to be found in the particular disease, and might therefore have diagnostic value. As a matter of fact, in some Pasteur Institutes, it is now the custom to search the tissues

of a suspected rabid animal for Negri bodies, and to give a positive diagnosis if these are found; animal inoculation being only resorted to in the event of this examination proving negative.

A fresh impetus, however, has been given to their study by the discovery of very minute granules in some of the diseases in question, more particularly in trachoma, variola, and molluscum contagiosum, in association with the cell inclusions. More recently a similar association has been found in contagious epithelioma of birds, in rabies, in varicella and in both human and experimental scarlatina. The granules in question are extraordinarily minute, and many approach the limit of visibility, which, as has been said, postulates an object of 0·1 micron in diameter. Modern methods of staining, improved lenses and new methods of illumination have permitted the recognition of these minute particles either in the fresh state, where they are best observed by dark-ground illumination, and are seen to have very active oscillatory movements, or in dried films or sections where they are brought out by special methods of staining, of which some variety of Romanowsky is most frequently employed. Much of the work which has led to these results was carried out by inoculating the virus into the cornea of rabbits, where the subsequent appearance of both inclusions and granules has been observed and studied.

The most weighty evidence, however, as to the nature of the granules comes from the investigations of Prowazek and Aragão during a small-pox epidemic at Rio de Janeiro.[1] They found the granules were capable of passing through a Berkefeld filter, and that the sterile filtrate was still virulent, but on filtering the same material through a special filter coated with agar, an "ultra-filter" as they term it, the granules were retained and the filtrate found to be no longer virulent. On examining the surface of the ultra-filter great numbers of the granules were found, while the filtrate contained none, a marked contrast to what had occurred in the case of filtration through the Berkefeld candle, where the granules were as abundant in the filtrate as in the diluted lymph before filtration.

These and other observations which are constantly being reported appear to lead more and more to the conclusion that these minute microscopic granules are the veritable causes of the diseases in question. Owing to their minute size it is impossible

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1 S. von Prowazek and H. de B. Aragão. "Variola-unter suchungen," *Memorias do Inst., Oswaldo Cruz.*, tom. i., fasc. 2, p. 147, 1909.

to ascertain accurately their life-history, or to be certain whether they should be included among the bacteria or, as Prowazek suggests, among the protozoa, but what appears to occur is something of the following nature. A small granule gains entrance to a cell—for example, a conjunctival cell in trachoma, a nerve cell in rabies, or an epidermal cell in small-pox—and causes a reaction of the cell which is expressed by the throwing out of some reaction product in the shape of a capsule or mantle of secretion which surrounds the invading particle. (Hence the name Chlamydozoa, which is framed on the word, χλαμὺς, a cloak or mantle.) In some instances this covering mantle attains a very considerable thickness, and the body is conspicuous as the cell-inclusion known as a Guarnieri's body, a Negri body, a molluscum body, and so forth. The original granule, which may or may not be visible within the enveloping mantle, has been called the "initial body." The initial body then proceeds to divide, and from it are formed great numbers of the extraordinarily minute little particles which may eventually escape from the inclusion and fill the cytoplasm of the cell; these derivatives of the initial body are known as "elementary bodies," and it is held that it is in this form that the virus extends to other cells or to fresh hosts and that, by reason of their minute size, they are able to pass through filters, as has been described.

It will be seen, therefore, that in this view the recently discredited cell-inclusion is to be regarded as an evidence of the reaction of the cell to the true virus, the chlamydozoon granule, and that it acts as an enveloping cover or capsule to the latter which multiplies within it, forming the elementary bodies which are capable of transmitting the disease further afield.

Turning once more to the cell inclusions found in this case of blackwater fever, it is with the utmost reserve that I suggest that they, too, may bear the same relationship to a minute parasite of the nature of a Chlamydozoon and that there is no insuperable objection to the theory that such a parasite may prove to be the cause of blackwater fever. The total number of inclusions found in these three films is far too small to permit of any definite views being advanced as to a cyclical development, such as has been described above, but it is possible that the minute granules depicted in some of the cells may bear a relation to the inclusions similar to that which appears to obtain in the case of small-pox, rabies and molluscum contagiosum.

Assuming that those Chlamydozoa which have already been

described are the actual causes of the diseases with which they are associated, it will be noticed at once that from the clinical point of view there is little in common between these diseases, while, if we include among them the other diseases which may be suspected of having a similar kind of virus, such as scarlet fever, foot-and-mouth disease, measles and perhaps yellow fever, the clinical dissimilarity appears even more striking. Objections therefore founded on such dissimilarity between the above diseases and blackwater fever would not have much theoretical weight. Certain facts, however, which appear to be well established from the accumulated experience of blackwater fever, may be briefly considered in the light of the tentative suggestion which I have put forward. The majority of the diseases attributed to the Chlamydozoa are known to be infectious, and they frequently spread in epidemic form; epidemicity is certainly rare in the case of blackwater fever, if it occurs at all; at the same time, instances of the apparent epidemicity of the disease have been recorded, although the evidence in connexion with these has not been very complete. The question of infectivity would, on closer inspection, also appear not to be an insuperable difficulty when it is realized that in the large preponderance of the diseases mentioned the virus is obviously localized to a large extent in the skin lesions or in the secretion of mucous membranes; in blackwater, on the other hand, no superficial lesions are in evidence, and the virus, if a specific one exists, is probably situated more deeply in the organs or tissues. The mass of evidence which goes to show that blackwater fever is only contracted by those who are the subject of frequently repeated malarial infection and is practically confined to those districts which are known to be intensely malarious might, with as great propriety, be urged as a reason for suspecting that a specific virus may be transmitted by the bites of mosquitoes, or other insects, as in support of the view that the disease is largely attributable to chronic malarial infection. In this connexion the parallel of yellow fever might be adduced, as it is apparently the case here that a mosquito is the transmitter of a filter-passer, while a similar example might be quoted in the case of the still undiscovered filter-passing virus of pappataci or three-day fever.

Such speculations, however attractive, are of little value in comparison with positive evidence, and I will only put forward one more, which appears to me to count against the theory of a Chlamydozoon being responsible for blackwater fever. In the

majority of the diseases mentioned as being apparently due to these parasites an attack if recovered from confers a considerable immunity against subsequent infection; in blackwater, on the other hand, this is known not to be the case, as second and third attacks are not infrequent and may prove fatal.

Where all is indefinite it would appear out of place to end this note with the customary "conclusions"—these are still to seek. The main object has been to call attention to these bodies in the hope that further search may demonstrate whether there is any foundation for my suspicion—it is little more—that they represent an invasion of the endothelial cells of the visceral blood or lymph vessels by parasites of the nature of Chlamydozoa.

PAPPATACI FEVER AT KAMPTEE, C.P.

By Lieutenant-Colonel C. H. HALE, D.S.O.
Royal Army Medical Corps.

In June, 1911, when Senior Medical Officer at Kamptee, C.P., I found that we were getting a considerable number of cases of fever of short duration with very great similarity in the symptoms; several of the cases were followed by a short relapse. The cases were evidently not malarial fever, and from the short duration enteric fever was negatived.

I asked Captain J. E. Ellcome, R.A.M.C., who was in charge of the medical wards, to take careful notes of all these cases; the notes of the following twenty cases, which all occurred in June, are extracts from Army Hospital Book 2. I thought the cases were more likely to be sand-fly fever, and on reading Lieutenant-Colonel Aldridge's pamphlet on "Pappataci Fever," published and distributed by the Government of India, I felt convinced that this was the correct diagnosis. I started a careful search for sand-flies, and the first day found a large number on the walls behind doors and windows and in the bathrooms of my bungalow. On microscopic examination we found some typical *Phlebotomus pappatasii* and other specimens which were subsequently proved to be identical with a control sand-fly sent us from Calcutta, by Mr. F. M. Howlett, the Government Entomologist, thus agreeing with the statement made by Lieutenant-Colonel C. Birt in his article on "Sand-fly Fever in India," in the Journal of August, 1910, p. 146, that, "F. M. Howlett says that at least two species of phlebotomus are found almost all over India and form the bulk of the pest known as sand-flies."

We had a meeting of all the medical officers and assistant-surgeons, at which we examined the flies under the microscope, read Lieutenant-Colonel Aldridge's pamphlet and discussed the symptoms of the cases in hospital, with the result that a unanimous verdict of pappataci fever was passed.

I then sent some sand-flies to Mr. Howlett, who kindly examined them and reported the presence of two varieties, *Phlebotomus minutris* and *Phlebotomus argenipes.*

On looking back through the admission and discharge book for three years the following figures were obtained for June, July and August:—

	1909			1910			1911			1911
	M.T.	B.T.	Negative	M.T.	B.T.	Negative	M.T.	B.T.	Negative	Pappataci fever
June	—	1	23	—	—	39	—	—	—	35
July	—	2	47	—	—	10	—	2	1	22
August ..	—	4	14	2	6	3	6	8	—	2

From the above figures it seems a fair inference that these cases of pappataci fever were in 1909 and 1910 returned as malaria (blood-negative), and one medical officer here states that last year the cases with symptoms exactly similar to those of this year were returned as malaria.

In July, up to the 19th, eighteen cases had been admitted and then an active campaign against sand-flies was undertaken in all barrack-rooms, bath-rooms, wash-houses, &c. The flies were pointed out to all N.C.O.s. and men, and in each barrack-room men were told off to go round morning and evening and kill all they could; we probably killed millions, and this certainly seems to have had a good effect, as during the remainder of the month we only had four more admissions for pappataci fever.

I only propose to give notes of twenty cases, as I consider that number sufficient to show the great similarity of the symptoms, duration of fever, relapses and other points worth noting. In every one of these cases a blood smear was carefully examined for malarial parasites, with a negative result.

Case 1.—Colour-Serjeant F. Admitted June 3 with fever (100° F.) of sudden onset, severe frontal headache and pains in loins and front of thighs. Bowels very constipated and tongue covered with a thick white fur. The temperature remained about 100° for twenty-four hours, and then dropped to 99°.

The headache and pains gradually decreased. The temperature remained between 98·6° and 99·8° for two days, and then again rose to 103·4° with severe headache but no other pains, and tongue still dirty; the temperature remained up till the following day and then fell to normal, the tongue rapidly became clean and the headache ceased. Recovery was marked by a good deal of prostration.

Temperature.—June 3: a.m., 100°; p.m., 100°. June 4: a.m., 99°; p.m., 98·6°. June 5: a.m., 99°; p.m., 99·8°. June 6: a.m., 99°; p.m., 103·4°. June 7: a.m., 101°; p.m., normal. June 8:

a.m., normal; p.m., normal, and continued normal. He had malaria in June, 1909.

Case 2.—Private McC. Admitted June 8, with fever of sudden onset (101°), severe frontal headache and slight pain in loins, constipation, and white furred tongue.

The fever, &c., subsided in forty-eight hours and he was soon well again.

Temperature.—June 8: a.m., 101°; p.m., 100·8°. June 9: a.m., 100°; p.m., normal, and continued normal. No record of malaria.

Case 3.—Private D. Admitted June 9 with fever (100°) and complaining of frontal headache and severe aching over the loins. The bowels were very constipated and his tongue very dirty. The temperature fell to 99° next day, and his fever lasted forty-eight hours. Recovery was marked by considerable weakness.

Temperature.—June 9; a.m., 100°; p.m., normal. June 10: a.m., 99·4°; p.m., 99°. June 11: a.m., normal; p.m., normal, and continued normal. No record of malaria.

Case 4.—Lance-Corporal S. Admitted June 9 with fever (101·6°), complaining of frontal headache and fairly severe pain in loins. Bowels constipated, tongue dirty. The evening temperature was 100°, and next morning normal, but it again rose to 100° in the evening. On June 11, temperature was normal, but the tongue remained coated with a thick white fur. After remaining normal for about seventy-two hours it rose to 102° in the morning, and remained for twenty-four hours between that and 99·4°, and the headache recurred, but not the loin pains. At the end of twenty-four hours all symptoms vanished, and he was soon well again.

Temperature.—June 9: a.m., 101·6°; p.m., 100°. June 10: a.m., normal; p.m., 100°. June 11: a.m., 98°; p.m., 98°. June 12: a.m., 97·8°; p.m., 98°. June 13: a.m., 97°; p.m., 98°. June 14: a.m., 102·4°; p.m., 100°. June 15: a.m., 99·4; p.m., normal, and remained normal. No record of malaria.

Case 5.—Private W., admitted June 11 with sudden onset of fever (101°), severe frontal headache, and pains across loins. Bowels constipated and tongue thickly coated with a white fur. The temperature in the evening and next day varied from 100° to 102°. On the third day it was normal, but though free of pains the tongue remained dirty. After remaining normal for seventy-two hours the temperature rose to 100° with a return of the headache, but no lumbar pains. After twenty-four hours it became normal, and all symptoms cleared up.

Temperature.—June 11: a.m., 101°; p.m., 102°. June 12: a.m., 100°; p.m., 102°. June 13: a.m., normal; p.m., normal. June 14: a.m., normal; p.m., normal. June 15: a.m., normal; p.m., normal. June 16: a.m., 99·2°; p.m., 100°. June 17: a.m., normal; p.m., normal, and continued normal. No record of malaria.

Case 6.—Private R., admitted June 11 with fever of sudden onset (101·2°), acute vomiting, severe frontal headache and pains across loins. The vomiting soon stopped after admission, but he was almost prostrate with headache and loin pains. Bowels constipated, and tongue thickly coated with white fur. Evening temperature 100°, and 99·8° next morning, falling to normal that evening with cessation of headache and pains.

Note.—Bradycardia had not been looked for in the above cases, but reading that it was a rather common occurrence during convalescence the symptom was watched for in the later cases.

Temperature.—June 11: a.m., 101·2°; p.m., 100°. June 12: a.m., 98·8°; p.m., normal, and continued normal. No record of malaria.

Case 7.—Private B., admitted June 11 with fever (102°), frontal headache and severe pains across loins: bowels constipated, and tongue covered with thick white fur. Evening temperature 102·6°, and lumbar pains apparently agonizing on the slightest movement, as in severe lumbago. Temperature 100° next morning, dropping to normal by evening, and the other symptoms subsiding. The pulse, after subsidence of fever, remained for forty-eight hours between 50 and 60 per minute.

Temperature.—June 11: a.m., 102°; p.m. 102·6°. June 12: a.m., 100°; p.m., normal, and continued normal. He had malaria in February, 1910.

Case 8.—Private B., admitted June 11 with fever (101°), frontal headache, and pains across loins, bowels constipated and tongue dirty. The temperature rose to 103° in the evening, and next day kept between 101·8° and 99°, dropping to normal on the third day with clearing of other symptoms. Pulse-rate between 50 and 60 per minute after subsidence of fever.

Temperature.—June 11: a.m., 101°; p.m., 103°. June 12: a.m., 101·8°; p.m., 99·6°. June 13: a.m., normal, and continued normal. No record of malaria.

Case 9.—Private F., admitted June 12 with fever of sudden onset (100°), severe frontal headache and slight lumbar pains, bowels constipated and tongue coated with thick white fur. The

temperature dropped to normal the same evening, and the headache was much less. The temperature remained normal for about seventy-two hours, and then rose to 101·6°, and in the evening to 103°, with a return of the headache but not of the lumbar pains; it fell to normal in twenty-four hours. It was noted that during the period of apyrexia the tongue remained very dirty, and made no attempt to clean until after the relapse. After the relapse the pulse-rate was between 50 and 60 per minute.

Temperature.—June 12: a.m., 100°; p.m., normal; June 13: a.m., normal; p.m., normal. June 14: a.m., normal; p.m., normal, June 15: a.m., normal; p.m., normal. June 16: a.m., 101·6°; p.m., 103°. June 17: a.m., 99°; p.m., normal, and continued normal. No record of malaria.

Case 10.—Private Y., admitted June 12 with fever of sudden onset (100°), frontal headache and very severe lumbago pains; bowels constipated, and tongue coated with thick white fur. The temperature fell to normal the same evening, and headache and pains vanished. After about seventy-two hours the temperature rose to 102·6° with frontal headache but no lumbar pains. The tongue during the relapse was slightly furred. After the relapse the pulse-rate was between 50 and 60 per minute.

Note.—This man was admitted to hospital for tachycardia, varying from 88 to 160 per minute on the day after discharge, and this did not improve with rest and treatment. A sequela of the pappataci fever?

Temperature.—June 12: a.m., 100°; p.m., normal. June 13: a.m., normal; p.m., normal. June 14: a.m., normal; p.m., normal. June 15: a.m., normal; p.m., normal. June 16: a.m., 102·6°; p.m., 101·6°. June 17: a.m., 100°; p.m., normal, and remained normal. No record of malaria.

Case 11.—Private L., admitted June 13 with fever of sudden onset (101·6°), severe frontal headache and severe pains across loins; bowels constipated and tongue coated with thick white fur; evening temperature 100·4°, next morning 99°, and normal that evening, with clearing of symptoms. Pulse 100 during fever, and 50 to 60 for twenty-four hours after fall of temperature.

Temperature.—June 13: a.m., 101·6°; p.m., 100·4°. June 14: a.m., 99°; p.m., normal, and remained normal. No record of malaria.

Case 12.—Bombardier M., admitted June 13, with fever of sudden onset (100°), severe frontal headache and pains across loins; bowels constipated and tongue foul. Evening temperature 101°,

next morning 99°, and falling to normal at night with cessation of symptoms. No bradycardia.

Temperature.—June 13: a.m., 100°; p.m., 101°. June 14: a.m., 99°; p.m., normal, and remained normal. No record of malaria.

Case 13.—Private G., admitted June 15 with fever of sudden onset, vomiting, severe frontal headache and severe pains across loins. Bowels constipated and tongue coated with white fur. Evening temperature 102·6°, next morning 101·2°, falling to 99° in the evening with relief of symptoms; next day normal. Pulse during convalescence 54 to 60 per minute.

Temperature.—June 15: a.m., 100·8°; p.m., 102·6°. June 16: a.m., 101·2°; p.m., 99°. June 17: a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 14.—Private W., admitted June 16 with fever (101·2°) of sudden onset, severe frontal headache and slight pains across loins; bowels constipated, and tongue coated with thick white fur. Evening temperature 100·2°, and normal next day. Pulse 50 to 60 per minute during convalescence.

Temperature.—June 16: a.m., 101·2°; p.m., 100·2°. June 17: a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 15.—Private D., admitted June 17 with fever (101·4°) of sudden onset, vomiting, severe frontal headache and pains across loins; bowels constipated, and tongue coated with white fur. Evening temperature 102°, next morning 99°, and remained at 99° for twenty-four hours, but though headache and pains disappeared the tongue remained dirty. After being normal for three days the temperature rose to 102° in the morning and 103° at night, falling to normal in twenty-four hours.

The duration of the initial attack was forty-eight hours, followed by seventy-two hours apyrexia, and then by a relapse lasting twenty-four hours. Pulse during convalescence 56 to 76 per minute.

Temperature.—June 17: a.m., 101·4°; p.m., 102°. June 18: a.m., 99°; p.m., 99°. June 19: a.m., normal; p.m., normal; June 20 and June 21: normal. June 22: a.m., 102°; p.m., 103°. June 23: a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 16.—Lieutenant T., seen on June 17 with fever of sudden origin (102·6°), accompanied by vomiting, very severe frontal headache and pains across the loins, he also complained of giddiness when sitting up. Bowels constipated and tongue very dirty. Evening temperature 102·8°, next morning 100°; it fell to normal

that evening. He complained of feeling very weak, but the other symptoms vanished.

The next two days the temperature was normal, but on the third day it rose to 101·2° with severe aching about the eyes; no lumbar pain. In twenty-four hours temperature was normal, and he was left feeling very weak.

No bradycardia. Convalescence was much protracted.

Temperature.—June 17: a.m., 102·6°; p.m., 102·8°. June 18: a.m., 100°; p.m., normal. June 19 and June 20: normal. June 21: a.m., 101·2°; p.m., 101°. June 22: a.m., normal; p.m., normal. No record of malaria.

Case 17.—Private E., admitted June 17, a typical case; the pulse remained 50 to 54 for three days after fever had gone.

Temperature.—June 17: a.m., 101°; p.m., 102°. June 18: a.m., 102°; p.m., 99·6°. June 19: a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 18.—Private P., admitted June 21; a mild but typical case lasting twenty-four hours, and followed by a pulse of 48 to 50 per minute for four days.

Temperature.—June 21: a.m., 101°; p.m., 100°. June 22; a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 19.—Dr. S., admitted June 22; a typical case lasting twenty-four hours, the fever reached 103·4°, and for the following two days the pulse was 48 to 50 per minute.

Temperature.—June 22: a.m., 103·4°; p.m., 101·8°. June 23: a.m., normal; p.m., normal, and remained normal. No record of malaria.

Case 20.—Private R., admitted June 13; a typical case; the fever lasted forty-eight hours, and was followed by seventy-two hours apyrexia, and then by a relapse which lasted about forty-eight hours.

Severe bradycardia set in and lasted for four days, the pulse varying from 36 to 50 per minute.

Temperature.—June 13: a.m., 102·4°; p.m., 100°. June 14: a.m., 101·4°; p.m., 100°. June 15 to June 17: normal. June 18: a.m., 102·4°; p.m., 102·6°. June 19: a.m., 100·6°: p.m., normal, and remained normal. No record of malaria.

NOTES.

(1) *Relapses.*—(*a*) Relapses occurred in seven cases, No. 4, 5, 9, 10, 15, 16 and 20.

(*b*) The tongue did not clean in the interval of apyrexia when a relapse occurred.

(*c*) The lumbar pains did not recur in the relapses.

(*d*) In most cases the period of apyrexia preceding the relapse lasted about seventy-two hours.

(2) *Leukopenia.*—Not having a hæmocytometer we could not determine the presence of leukopenia, which is reported as characteristic of the fever.

(3) *Drugs.*—(*a*) Aspirin, though quite useless in some cases, gave great relief to both headache and lumbar pains in other cases.

(*b*) Quinine seemed undoubtedly to aggravate both these symptoms, and was only given in two cases.

(4) *Sand-fly Bites.*—These leave most irritating wheals which persist for days if untreated. On interrogating the men in different barrack-rooms they seemed to know that they were not being bitten by mosquitoes, and it was rather curious how many of them were quite convinced that they were being bitten by mango midges.

Strong Scrubb's ammonia has not the slightest effect, though in a few minutes it relieves the irritation of mosquito bites. After a good deal of experimenting I found that painting with tinct. iodi. B.P. gives rapid relief and causes early disappearance of the wheal. This opens two questions, viz :—

(*a*) Would early painting with tinct. iodi. prevent the onset of the fever?

(*b*) Would the internal administration of iodide of potassium relieve the symptoms? I shall certainly try the latter if we get any more cases.

(5) *Prevention.*—Sand-flies unfortunately can pass through an ordinary mosquito curtain, but I have found that they cannot face camphor, and during June and July I have not been bitten once in my mosquito room, and the only two sand-flies I saw inside the curtain dropped in a dazed state on to my book and were easily killed. I keep four squares of camphor on my bed night and day, and the mosquito curtain is always left down. Just before getting into bed I pulverize a few small bits of camphor and sprinkle the bed with it. The smell of the camphor seems to cling to the mosquito curtain and can be smelt from the outside quite well if the curtain is put close to the nose. This camphor plan seems absolutely reliable, as I have for weeks slept with merely a flannel vest on and no sheet over me, but on rising in the morning I have found my bedroom walls covered with numerous sand-flies, yet not once have I been bitten.

(6) Most of the cases admitted had more or less conjunctival redness, but as this is present in this station in nearly all cases of fever no allusion was made to this symptom in the notes.

THE CHEMICAL STERILIZATION OF WATER FOR MILITARY PURPOSES.

By CAPTAIN V. NESFIELD.
Indian Medical Service.

MAJOR C. F. WANHILL'S interesting paper in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS of August, 1911, on the subject of a pure water supply in the field, does not, I consider, deal fairly with the sterilization of water by chemicals. During the last eight years I have had very great practical experience of the possibilities and limitations of the chemical sterilization of drinking water by iodine, chlorine, permanganate of potash and mercury.

IODINE.

The process I employ is known by Evans's name in England, by my own in India, and by Vaillard's in France. Vaillard was, I believe, scientifically prior to me; the exact date of his publication in a foreign journal was, I think, September, 1902, but Colonel Firth, R.A.M.C., writing to me on the subject, says that he first received samples in November, 1902. I had already worked out the process by the end of 1901. I attended Colonel Firth's lectures in September and October 1902, delivered to the newly joined members of the Royal Army Medical Corps and Indian Medical Service (September, 1902). During these lectures he made no mention of the iodine process, because, as he tells me in a letter, he had not then seen any samples.

In February, 1903, at the request of a chemical firm, I applied for British patents for the process, and obtained them; later I also applied for Indian and South African patents.

I finally gave the process to Messrs. Evans, Sons, Lescher and Webb, 60, Bartholomew Close, London, E.C.; and they called the tablets by the name of "Evans" at my request.

I have mentioned these details in self-defence, as Major Wanhill says: "The iodine method of Vaillard several times reborn under different names."

The process was born as a twin birth, in England and in France; and has not been reborn since.

To show further that my work was independent of Vaillard, I must explain what led me to the use of iodine: I set out with the object of discovering a chemical method for the sterilization

of water; and worked on the basis that the chemical must be convertible into a substance which is innocuous to human beings. This limited me to the chemicals which already exist in natural waters.

It was the South African War which made me think of the work. I experimented with the peroxides, nascent hydrogen, sulphuric acid, hydrochloric acid, phosphoric acid, and finally with nascent chlorine. In chlorine I found the desired chemical, and put it in a practical form by using liquefied chlorine in steel cylinders, with a simple device for measuring the dosage.

For small quantities of water I experimented with hypochlorite of lime, compounded with bicarbonate of soda, to form a tablet. On adding this tabloid to water, free chlorine is evolved, and an insoluble tablet of chalk remains behind. I found, however, that the hypochlorite, on account of its instability, was unsatisfactory. I therefore gave up chlorine for small quantities of water, such as 1 to 2 pints, and experimented with its first cousin, iodine, which has a very stable iodide and iodate, though when combined together they readily split into free iodine in the presence of weak acids, for which purpose I selected tartaric acid. But as it was impossible to combine the acid with the iodide and iodate mixture, the two substances had to be made into separate tablets.

At first I used sulphite of soda to de-iodize, but as this salt does not keep well in India, I used later thiosulphate, $Na_2S_2O_3$, or as it is commonly called the hyposulphite.

This is how I arrived at iodine and the three tablets, and maintain that anyone who had taken up the research on the same lines as I did would have arrived at exactly the same results.

A comparison of Vaillard's process and my own further shows the following differences:—

Quantity of Iodine (*a*).—Vaillard uses 0·06 grm. per litre. I originally used ½ grain (0·04 grm.) per gallon.

(β) Vaillard uses a great excess of potassium iodide, so as to form an iodine solution. I used the exact quantity represented by the formula 5KI. KIO_3, the iodide being produced as a fine black precipitate, which dissolves on being put into the full bulk of water.

(γ) Vaillard recommends twenty minutes with his large dosage, but I consider one minute sufficient where 1 to 2 pints are concerned. Vaillard uses altogether more than fourteen times as much iodine as I do.

I would indeed have been a bold pirate if, in the case of a man

of Vaillard's standing, I had not only taken the process, but also cut down the dosage and time exposure to a fifteenth. Vaillard and I must have employed very different technique to have arrived at such different figures.

The Process (Iodine).

Tablet A consists of potassium iodide and iodate mixed together in the proportions represented by the formula 5KI. KIO_3—quantity 1½ grain per gallon.

Tablet B consists of citric or tartaric acid—quantity 1½ grain per gallon.

Tablet C consists of hyposulphite of soda—quantity 1½ grain per gallon.

Directions.

Dissolve the *A* and *B* tablets together in the minimal quantity of water possible to dissolve them (10 minims for each grain). Add the resulting black precipitate of iodine and the fluid to the full bulk of water; stir. The water then becomes tinted a faint yellow. Allow it to stand for five minutes. Meanwhile dissolve in some of this tinted water the *C* tablet, and add to it the bulk of water; stir. The water is now tasteless and fit to drink. (There is no actual waiting necessary, as the larger *C* tablets take fully five minutes to dissolve). The quantity of iodine employed equals 1 in 70,000.

Special Points.—(1) *Taste.* If this be present it is due to the *A* and *B* tablets being dissolved in too much water, and in consequence some iodate remains unchanged. *A certain concentration of citric or tartaric acid is necessary to completely split up the iodide and iodate compound. Every grain should be dissolved in* 10 *minims of water.*

Further, so as to ensure that no free iodate remains, an excess of 5 per cent iodide is compounded with the iodate.[1]

$$5\,KI,\ KIO_3 + \underset{\text{Tartaric acid}}{2\,H_3C_6H_5O_7} = 3\,I_2 + \underset{\text{Pot. tart.}}{2\,K_3C_6H_5O_7} + 3\,H_2O$$

(2) *The acid tablet* tends to become hard, hence a trace of chalk is compounded with it. On being placed in water CO_2 is evolved in the interior of the tablet, which brings about its rapid disintegration.

(3) A little carbonate of soda (2 per cent) is added to the hyposulphite, as this helps de-iodization.

[1] One part of pot. iod. by weight to 4·5 parts of pot. iodate.

(4) *The Condition of the Water.* If muddy it should be strained. The strainer for large quantities of water consists of a butterfly pump (all brass, no washers) connected with a small brass cylinder, packed with absorbent cottonwool. The whole is in a small box weighing altogether 25 lb. This will deliver clear water at the rate of 50 gallons in twenty-five minutes. It is absolutely necessary to strain off the larger mud particles, as iodine will not penetrate into them. Where time is important the water should be iodized before being passed through the strainer. The hyposulphite is then added to the clear water.

If the water is obviously very greatly contaminated, double doses of tablets should be used. If the water is apparently good and clear, and its source known—*e.g.*, in a standing camp—double the quantity of water can be sterilized by one set of tablets.

I have worked out the quantity of iodine that a large number of waters absorb, and have taken this into consideration when stating the above doses.[1]

The special vessel for holding water is a round flat-bottomed bag 1½ ft. deep by 2½ ft. diameter, made of one layer of Willesden canvas. When filled the sides are supported by the weight of the water. To keep the free edge from falling, six rope loops are provided; these are hitched over six light iron rods with split tops pushed an inch or so into the ground round the tank.

(5) *The Quantity of water which can be sterilized.*—Major Wanhill states that chemicals are fairly certain in their action in small quantities of water but not in large, without bulky mechanical contrivances. *This is not the case*; 1,000 gallons can be readily sterilized. This was given a very full trial in some engineering works in the Bombay Presidency. I have myself frequently sterilized 500 gallons in the Gauhati, and Barisal gaols.

The three substances are put up in powder form in separate bottles. The stirring is carried out by means of a pole, to the bottom of which a small piece of board is nailed.

The thoroughness of the mixing can be readily proved by adding some coloured substance, *e.g.*, potassium permanganate or methylene-blue, to 1,000 gallons of water, and taking samples after five minutes stirring, and comparing tints, or more accurately by taking samples of iodized water and planting into culture tubes.

(6) *The result on the System after long continued Use.*—The officers of K. E. O. Cavalry, 18th Punjabis and 1st Brahmans, drank

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[1] *Journal of Preventive Medicine*, October, 1905. *Indian Medical Gazette* July and August, 1905.

soda water sterilized by this process for three years on end, without any harm resulting. The 1st Brahmans have drunk water sterilized by this process for seven years.

The quantity of iodine used for the soda-water is $\frac{1}{2}$ gr. per gallon. The average amount of water or soda-water drunk per day is only 4 pints even in the hottest weather; this would contain $\frac{1}{4}$ gr. of iodine, a negligible quantity.

The Practical Proofs.

(1) During the Tibet Expedition of 1904, with Lieutenant-Colonel Willan Dawson, I.M.S., I took a batch of 760 Kashmeri coolies through the Teesta Valley, during a very severe cholera epidemic. Not one coolie contracted cholera. Other batches of coolies during the same period had deaths from cholera varying from 2 to 10 per cent of their number. The quantity of iodine used was $\frac{1}{2}$ gr. per gallon.

(2) The Cameronians when marching from Dhera-Dun to Chakrata, 1905, drank water containing $\frac{1}{2}$ grain of iodine per gallon. There was no water-borne disease.

A few months later, detachments of British troops marching along the same route developed cholera. Their water was supposed to be boiled.

(3) Barchacha Artillery Camp, 1906, duration three weeks. Captain Steele, R.A.M.C., Medical Officer in charge. The quantity of iodine used was $\frac{1}{2}$ grain per gallon, fifty gallon powders being employed. There was no water-borne disease.

(4) Agra Concentration, for Amir of Afghanistan. 1st Royal Dragoons from Lucknow to Agra and back, also during the manœuvres at Fatehpore, Sikri.

Report of Colonel H. de B. de Lisle, Officer Commanding 1st Royal Dragoons, dated Lucknow, February 20, 1907.

"(1) Water sterilizing tablets were used on the march to Agra and back, at Bichpuri Camp, and at manœuvres near Fatehpur, Sikri; during the period of eight weeks there was not a single case of water-borne disease among 435 officers and men.

"(2) Mineral waters were prepared on the march and in camp with water sterilized in this way. An attempt was made to use water boiled by a special sterilizer which was on trial, but the water which was supposed to be cooled in the process was too hot for the manufacture of mineral water or for drinking.

"(3) When the tablets are used in double strength they

undoubtedly leave a taste of iodine in the water; still, I am of opinion that this is the only way to provide sterilized water for drinking purposes when on the march.

"This process was found to be a great boon to the men, who on reaching camp could obtain a cold drink at once, instead of having the alternative of waiting for boiled water, or drinking impure water."

Report of Major W. Sandys, R.F.A., Commanding 74th Battery R.F.A., dated Bichpuri, January 7, 1907.

"I consider that the tablets are most excellent in every way, and far superior to the antiquated method of boiling with its attendant slowness. The single strength is ample for safety purposes; the double strength gives a decided taste, which is not liked.

"The process was used for about eight weeks; there was no water-borne disease."

Report by Major G. W. Grove, R.F.A., Commanding 79th Battery R.F.A., dated Lucknow, February 12, 1907.

"The tablets and powders were used by the battery on the march to and from Agra, from December 11, 1906, to February 4, 1907 (both dates inclusive), for sterilizing drinking water, and proved most effective for that purpose, considering the bad water met with along this particular route.

"The 'C' tablets and powders did not quite remove the taste of iodine (when used in the proportion laid down in the list of instructions), but on more being added the water became both colourless and tasteless."

The 17th Lancers, 7th Hussars, four Gurkha regiments and some batteries of the 7th Meerut division also used this process going to and from Agra, and there was no water-borne disease.

The quantity of iodine used in these tests was 1 gr. per gallon; it was allowed to act for ten minutes. The "C" tablets and powders were carelessly manufactured, and so the water was not always tasteless.

During the plague relief operations, Belgaum, May, 1906, 6,500 gallons of water were sterilized daily for two months. There was no water-borne disease.

During the famine relief operations, United Provinces, 1906-07. The process was used extensively; altogether over 1,000,000 gallons were sterilized, ½ gr. iodine per gallon being used. There was no cholera. Special mention of the process was made by Sir J.

Hewett, Lieutenant-Governor, United Provinces, in an address concerning the famine.

During the Mohmund Expedition, 1908, cholera broke out at Peshawar. The process was then employed throughout the expedition; the only source of water was from foul tanks. No further cholera occurred.

The process is at present being used on the Abor Expedition by the 32nd Pioneers, as no other method of water purification is possible. Up to date there has been no cholera.

It will surely be admitted that the above practical tests have shown this process to be thoroughly sound.

The Method of Ascertaining that the Water is Sterile.

Since 1906 I have carried with me the following culture pills, and frequently tested the sterility of the water:—

Sodium taurocholate	$\frac{1}{2}$ grain.
Peptone	1 ,,
Lactose	1 ,,
Sodium carbonate	$\frac{1}{10}$,,

Kept in a stoppered bottle in dry lactose powder. One pill is put in a test-tube, and one teaspoonful of water is added, a gas tube introduced and the mouth of the tube plugged with wool.

The contents are now heated over a spirit flame till the fluid has boiled for one to two minutes. The tube is then cooled. The teaspoon is heated over the spirit lamp, plunged into the water to be tested, and a sample (not heated by the spoon) removed and added to the culture tube. A control of untreated water is also put up.

The tubes are next left in a warm corner of the room to incubate, but in the cold weather they are put into an empty box at night, together with a small lighted kerosine oil lamp; or the tubes may be put in a tin which is hung over a hurricane lantern.

The control usually showed gas, cloudiness, and marked acidity; the sterilized water never showed any gas, only faint cloudiness and faint acidity to litmus being produced.

Scientific Proofs.

In the *Indian Medical Gazette*, August, 1905, Major F. N. Windsor, I.M.S. (Chemical Examiner, Calcutta), published a full statement, and also the following germicidal values for iodine, prepared from the tablets:—

STRENGTH OF IODINE 1 IN 260,000.

—	Count after 1 minute in 1 c.c.	Count after 5 minutes in 1 c.c.	Count after 20 minutes in 1 c.c.	Bouillon tube
A. Untreated typhoid water	96,000	90,000	84,000	Growth
B. Iodized typhoid water	*Nil*	*Nil*	*Nil*	*Nil*
C. Untreated cholera water	70,000	70,000	65,000	Growth
D. Iodized cholera water	*Nil*	*Nil*	*Nil*	*Nil*
E. Iodized *B. coli communis* water ..	,,	,,	,,	,,

As regards the three tablets being an objection, this is really groundless, as the above extensive practical trials fully bear out.

The Cost of the Process.

At the lowest rate this works out at 6d. per 100 gallons.

CHLORINE.

Chlorine is as efficacious as iodine for sterilizing water, and I have frequently published articles on this subject since 1903.

(*a*) Chlorine may be used in the form of liquefied gas stored in steel cylinders. I have used this fairly extensively. The gas passes through a brass nozzle occupied by a piece of fine-bore thermometer tubing; the length of the glass tube is such that only 1 gr. of chlorine gas passes per second.

The water is dechlorinated by means of hyposulphite of soda. One grain of chlorine per gallon is used and allowed to act for ten minutes.

(*b*) *Hypochlorite of Lime.*—This I think is simpler than the liquefied chlorine gas. Hypochlorite of lime very soon decomposes in India; this is not due to heat alone, but also to CO_2.

Thus :—

$$Ca(OCl)_2CaCl_2 + 2\,CO_2 + 2\,H_2O = 2\,CaCO_3 + 2\,Cl_2 + 2\,H_2O.$$

If the hypochlorite be sealed in glass tubes, it will keep indefinitely.

The only remaining difficulty is that hyposulphite of soda will not remove quite all the taste imparted to the water, this has been a great objection to the process; but on going into the causes for this, it appeared to be due to some hypochlorite remaining unchanged.

When bleaching powder, calcium hypochlorite, is added to water,

it reacts with the calcium and other bicarbonates, free chlorine being produced.

Thus :—

$$\underset{\text{Bleaching powder}}{Ca(OCl)_2CaCl_2} + \underset{\text{Bicarbonate of lime}}{2\ Ca(HCO_3)_2} = 4\ CaCO_3 + 2\ Cl_2 + 2\ H_2O.$$

But, some $Ca(OCl)_2$ is not acted upon, and remains as such, or as hypochlorous acid. Potassium iodide in conjunction with the hyposulphite completely removes all the hypochlorous acid and taste.

Thus :—

$$\underset{\text{Hypochlorous acid}}{2\ HClO} + 2\ KI = \underset{\text{Iodine}}{I_2} + 2\ H_2O + 2\ KCl.$$

The iodine is then absorbed by the hyposulphite.

Thus :—

$$\underset{\text{Iodine}}{I_2} + \underset{\text{Hyposulphite of soda}}{2\ Na_2S_2O_3} = 2\ NaI + \underset{\text{Sodium tetrathionate.}}{Na_2S_4O_6.}$$

Messrs. Burroughs Wellcome and Co. have made sealed tubes for me containing 25 gr. of dry calcium hypochlorite.

And tabloids consisting of :—

Hyposulphite of soda	25 grains.
Potassium iodide	5 ,,

The directions for use are: Shake the powder down away from the filed end. Heat the file mark with a lighted match, and touch with a drop of water. Break off the end. Mix the contents with a little water, using the unbroken end of the tube for stirring. Add to 50 *gallons* of water, stir, and leave for ten minutes. Now add the hyposulphite tabloid previously dissolved in some of the chlorinated water. Stir till all the taste has gone.

This process costs 2d. per 50 gallons.

The water if previously yellowish in colour is bleached and becomes crystalline in appearance. Muddy water must be strained.

Permanganate of Potash.

I have found that ½ gr. of permanganate of potash per gallon will kill *Bacillus coli* in one hour, when this microbe is present in water obtained from wells, and also from the Rivers Ghumtee and Jumna.

It is not generally known that permanganate of potash actually destroys bacteria in this dilution, but this is the case, as can be proved by anyone who cares to carry out the test.

The marvellous efficacy of permanganate of potash in cholera was fully exemplified in July and August of this year in Barabanki,

Oudh. Every well in the infected villages was treated with two teaspoonfuls of crystals. The cholera stopped in two weeks, the total number of deaths being altogether 15,992 in the space of two and a half months.

The same result was obtained in Lucknow during the same months.

PERCHLORIDE OF MERCURY.

One part in 500,000 of water will kill *B. coli* in thirty minutes, i.e., $\frac{1}{7}$ gr. per gallon, or $\frac{1}{50}$ gr. per pint.

I am having little books like litmus papers made, each paper being impregnated with $\frac{1}{50}$ gr. perchloride of mercury. One paper to be put into a pint of water, to be drunk thirty minutes later. In 1908 I tried this method on a large scale in Quetta, during an epidemic of cholera in the 2nd Battalion 7th Gurkhas. The water supply was from large 1,000 gallon tanks. The treated water was drunk for one week.

In conclusion, I do not believe that any method for purifying water by filtration or heat will ever prove practical, and that we shall have to depend upon chemical sterilization. Different circumstances require different chemicals.

(1) In the case of widespread cholera outbreaks in a civil population, where the water supply is from wells, *permanganate of potash* is the best drug, on account of its cheapness. All that is necessary is to faintly tinge the water pink.

(2) In the case of standing camps, and for British troops on the march or in warfare, I consider *hypochlorite of lime* to be the best material, when quantities of from 50 to 100 or more gallons are sterilized at a time; it is then the cheapest method.

(3) In the case of small detachments, when the water vessels consist of the 8-gallon mule pakhal, or the 2-gallon bucket; and in the case of officers' messes, and soda-water factories, I consider the *iodine process* to be the best, as being the cheapest.

(4) In the case of individual officers, or travellers, requiring only 1 or 2 pints of water at a time, the *iodine process* is the best.

(5) For the individual soldier, in times of emergency, when he is cut off from the water supply of his company or regiment, I consider the *perchloride of mercury papers* to be the best, as being the simplest.

I consider the *acid sulphate of soda*, 15 gr. per pint, to be too bulky and uncertain to be of any practical value, besides erroding the interior of iron water-bottles.

OBSERVATIONS ON THE MODERN COAL-TAR DISINFECTANTS AS REQUIRED FOR SERVICE PURPOSES.

By Major C. F. WANHILL.
Royal Army Medical Corps.

To the average man the process of disinfection is a mysterious one. A disinfectant is considered to be a material which kills the organisms of disease. Few people, however, know what is the exact action of the agents they use for this purpose, and fewer still have any scientific knowledge on the subject. It has thus become, except in a few cases, a practice to accept the claims of the makers of disinfectants as to their killing power and also as to their suitability for the various purposes for which they are required. If the sale of disinfectants were regulated by the State this might be legitimate, but since this is not the case it is necessary that the individual employing them should possess some knowledge as to their mode of action and suitability for particular purposes. It is not too much to say that some of the articles sold to the public and to the medical profession fall far short of what is claimed for them.

The action of metallic salts, such as perchloride of mercury and carbolic acid, &c., is well understood, as they have been in use for a considerable time, and their composition as well as their limitations are known. Very little is known, however, about the composition, mode of action and uses of the coal-tar derivatives called in the trade "Phenoloids," which represent the most recent developments, and what little is known is the property of those who make them and of a few chemists whose business it is to analyze and standardize them. The majority of these preparations are proprietary articles and are open to the objections which usually apply to these preparations. With most articles of this description the sales depend on the results produced, but with disinfectants, as with patent medicines, the difficulty of ascertaining whether they have been successful or not prevents a correct judgment being formed as to their qualities. It is therefore possible for an article to be placed before the public, and, if sufficiently advertised, to be purchased by them although it does not possess the merits claimed for it. In a scientific service like the Royal Army Medical Corps this is not sufficient, and at the Royal Army Medical College there is an expert department where such articles are tested. Since however

it is not possible for the Corps at large to be familiar with the intricacies of the testing of disinfectants and their qualities—and the number of different ones officially sanctioned is small—a short paper on the subject should not be out of place.

Dealing with the coal-tar derivatives only, since the others are fairly well understood, it may be stated that the acids which form the basis of these articles are obtained by the fractional distillation of the waste products from the gasworks. Carbolic acid is first recovered, but this has such a value in the market, for purposes other than disinfection, that it is rarely supplied unless actually asked for. For instance, "carbolic powders" now rarely contain carbolic, but some of the higher forms of the acids. This is as it should be, for with these acids lime may be used to form a basis for the powder; but with carbolic acid lime forms an inert compound. After the distillation of carbolic acid has ceased other acids distil over which become thicker and thicker in their consistency. They are heavy black oils and are the basis of the higher disinfectants. They are insoluble in water and hence require to be made into emulsions before they can be used. As a rule the more viscid the oil the better the disinfectant it will make, though, being more difficult to bring into an emulsified form, it can only be used by those manufacturers who have perfected their methods for attaining this result. It is therefore not difficult to understand how impossible it is for a firm which has only taken up the subject recently to manufacture a really good disinfectant, and to compete with the older established makers.

The emulsions are made by the addition of resin soaps, gelatine, or glue, the addition of one or the other of these materials forming products with different properties and applicability. The addition of resin soap forms a disinfectant which mixes well with water in a soapy emulsion, and is very convenient for washing floors, linen, &c., and the hands. Such a mixture is pleasant to work with for this reason, but it will be easily understood that where hard or sea water has to be used the combination of the salts in the water with the soap basis spoils the emulsion. Since it is supposed that the finer the state of division of the droplets of the tar oil the more readily they act on or "saturate" particular matter, and therefore bacteria, it will be seen that anything which throws the oil out of emulsion militates against its usefulness. The glue preparations, however, are not liable to this disadvantage, since salts have no action on that material and such products can be used with hard and sea waters. They are, however, not so pleasant to use, and do

not act on the grease which may envelop bacteria as does a disinfectant made with soap. Soap emulsions are also more stable on keeping.

All disinfectants made with glue tend to separate out into layers when stored in bulk or made up into working dilutions, and the degree to which they do this decides their usefulness. Even the best preparations with a glue basis, in bulk and in dilution, separate to a slight extent, though for practical purposes this is usually negligible, while some of the inferior preparations separate out so much as to be of doubtful value. In the Service it is imperative that these preparations should be capable of being stored, both in temperate and tropical climates, without marked separation, as one which separates out into layers would require thorough mixing each time any issue, however small, was made, and mixing, in the case of a big heavy drum, is not easy. The soapy emulsions separate to a much less degree, and hence are thought to be more suitable for Service needs. Now, in the case of a potent disinfectant, i.e., one of the heavier tar oils emulsified with glue, the emulsion to be stable has to be very viscid. This is again undesirable, since such a material is difficult to mix with water. As will be seen from the accompanying photographs, thick emulsion sinks to the bottom of the vessel in large drops, hardly mixing with water at all. Suppose an orderly is required to mix a measured quantity of a disinfectant with the amount of water calculated from its known carbolic co-efficient; he would probably place the water in a pail and then pour the disinfectant into it. The disinfectant would sink to the bottom and would be then stirred up with a stick, forming, as all emulsions do, a thick opaque cloud which would prevent the orderly knowing whether the drops in the bottom had been used or not. There would thus be a loss in many cases of probably one-third of the measured quantity. The disinfectant would also stick to the vessel and it would be very difficult to pour out the required quantity. It is not likely that an orderly would wash out the vessel with water until all the disinfectant had been transferred to the bucket. So, with a careless man making use of these disinfectants, it is not too much to say that at least a third of the required quantity of disinfectant would be left in the vessel. Thus the resultant disinfectant solution would only be a third of the calculated strength and would be quite unfitted for the purpose for which it was intended. This is the more serious as the amounts used with the high co-efficient disinfectants are very small. Taking a disinfectant with a carbolic co-efficient of 18, viz., eighteen times

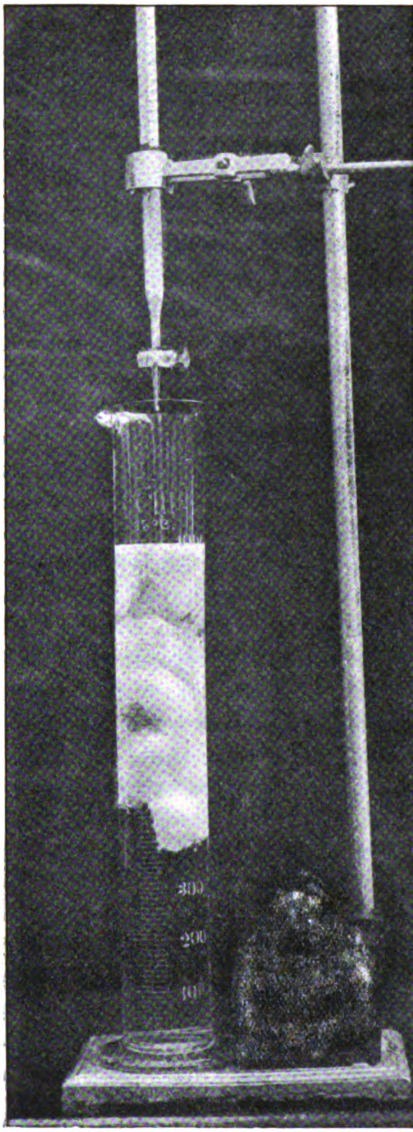

Fig. 1.—Disinfectant mixing fairly well, but drops tend to form and fall to the bottom.

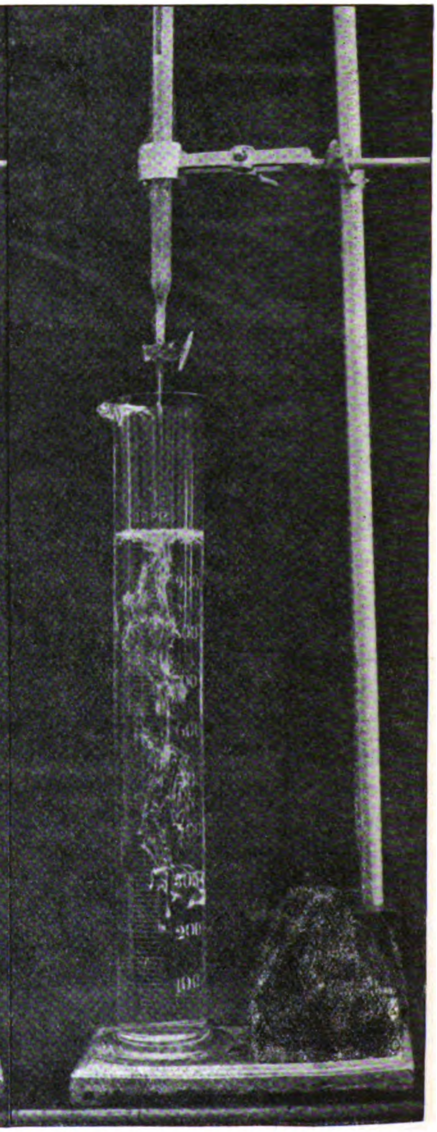

Fig. 2.—Disinfectant mixing very badly with water.

stronger than carbolic, in order to make an emulsion of it equal to 1—20 carbolic acid we should require 0·45 of an ounce in one gallon of water.

When using this small quantity it is evident that even small losses of the disinfectant are of great importance.

Soap emulsions, though they fall to the bottom of water in a vessel as readily as the glue preparations, form an emulsion with very little stirring, and are easily washed out from the containing vessel. They would thus, except for the limitations already given, seem to be preferable for general purposes.

Where hard water or sea water has to be used occasionally, it has been thought that a glue emulsion is preferable for general purposes. It must, however, be borne in mind that, if a soap emulsion is first made up with soft water in a strong mixture and this added to hard water or sea water, it will remain in emulsion for some considerable time, in all probability long enough for disinfection to take place.

If a glue emulsion is used some standard of viscosity and miscibility should be made. It has been found by experiment that in many, if not in most, cases the viscosity of a disinfectant and its miscibility with water go together, and that the former, which can be easily determined in a fairly accurate manner, can be taken as an index of the latter. Miscibility can be estimated, roughly, by the eye, as is shown by the accompanying photographs, but it is difficult to ensure standard conditions in all cases. If the two tests are used in conjunction it will be possible to see at once when the viscosity and miscibility differ.

Miscibility can be roughly determined by the instrument shown in fig. 3. The rate of flow of B.P. olive oil is first determined, i.e., the length of time taken to fill the 50 c.c. measure when the water bath is at 60° F. This should be done several times and an average taken. The disinfectant can then be introduced, the apparatus having first been cleaned with alcohol and ether and then dried. The time taken to fill the 50 c.c. measure should be noted and divided by the average for olive oil. This gives a factor. B.P. olive oil varies slightly in its viscosity with age, but is sufficiently stable for a rough estimation. Other forms of apparatus are expensive and difficult to work, but it is thought that an approximate estimation is sufficient. The apparatus can be worked by persons of little skill, and also gives fairly constant results.

Besides being of use as general disinfectants, the higher tar acids are non-corrosive, practically non-poisonous, and are not absorbed

in the intestines. They can therefore be used without producing the effects on the hands which result from carbolic acid; they also do not irritate wounds. They can be given internally where partial

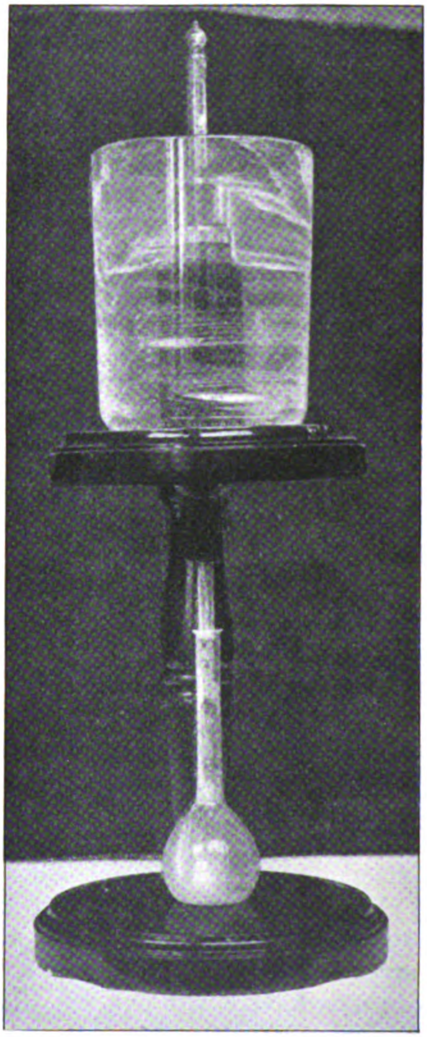

FIG. 3.—Viscosity apparatus. Disinfectant (black) in central vessel, surrounded by water at 60° F. Time to fill flask to 50 c.c. mark noted and divided by average time to do this with olive oil B.P.

sterilization of the intestinal tract is indicated; in fact, one of them, cyllin, has been put up in capsules for this purpose. It is claimed that this material will actually sterilize the intestinal contents.

Care must be taken in their administration, as if they escape from the capsule while in the stomach they cause considerable nausea. If keratin is used, on which the gastric juice has no effect, but which dissolves in the intestine, this objection disappears. The higher tar acids are unsuited for the disinfection of instruments in the operating theatre, as the opaque emulsion obscures the instruments. The soap emulsions also make the hands or gloves too slippery to secure a firm hold of the instruments. For washing out septic cavities they are invaluable, as besides their disinfectant power they are not absorbed. They are not suited for the impregnation of dressings, as they will not dry. Lysol and the preparation described in the B.P.C. are preparations of cresylic acid made up with soap and are open to the objections given above when used for instruments, while their carbolic coefficients are low. They are also irritating to the skin if used in a concentrated form.

Disinfectants of the class described above, in common with practically all others, tend to lose their power in the presence of organic matter, especially if it is in fine division. Their action is supposed to be due to the adhesion of their molecules to the particles of matter rather than to any toxic influence. They can therefore be deprived of their potency as easily by starch, by powdered fæces or by bacteria. Since the ratio of their killing power, as expressed by the Rideal-Walker method, to that of carbolic acid is determined on naked organisms and drops very considerably on the introduction of particulate organic matter, this must be borne in mind when they are used. The Rideal-Walker method must be considered the best to hand for ascertaining in an arbitrary manner the strength of a disinfectant, though it is only a rough indication of its killing power under natural conditions. Since it is almost impossible to reproduce natural conditions in the testing of a disinfectant, it is better to use some simple method like the Rideal-Walker, which will enable some idea of the value of the sample to be determined.

It must be borne in mind that when stored for a time the co-efficient of most of these disinfectants tends to fall. With some the drop is as much as from 18 to 12. This may be due to separation into layers or to other, as yet not understood causes.

Though at first sight the disinfectants with the highest coefficients may seem to be preferable, it has now been shown that they suffer from disabilities from which those with a lower coefficient are free, or at any rate suffer to a less extent. The higher

the co-efficient the thicker and less easily miscible is the emulsion, and the greater is the tendency to loss of co-efficient. With resin soap emulsions, as has been already said, this does not apply to any great extent.

I would suggest the following specification for a disinfectant:—

(1) It must be non-poisonous, non-corrosive, and must not stain clothing.

(2) It must be easily miscible with water in all dilutions. If prepared with a glue base it must not have a viscosity, as compared with B.P. olive oil at 60° F, of more than 0·3.

(3) It must not separate into layers to any great extent, if stored in bulk for a year.

(4) When mixed in working dilutions it must remain stable in emulsion for twenty-four hours with soft water, for eighteen hours with hard water, and if made up first with ordinary water for two to three hours with sea water.

(5) It must not lose more than 10 per cent of its carbolic acid co-efficient after storage for a year in hot climates.

(6) It should have a carbolic co-efficient of 10 with distilled water, and 6 when mixed with sea water or with 50 per cent urine.

NOTE ON THE NEW AMERICAN INFANTRY EQUIPMENT.

By Captain N. DUNBAR WALKER.
Royal Army Medical Corps.

The carrying receptacle of this equipment marks a departure from the generally recognized type of haversack or knapsack. It consists of two flat-shaped pieces of olive-green canvas bound with braid, capable of being converted into a bag of varying dimensions.

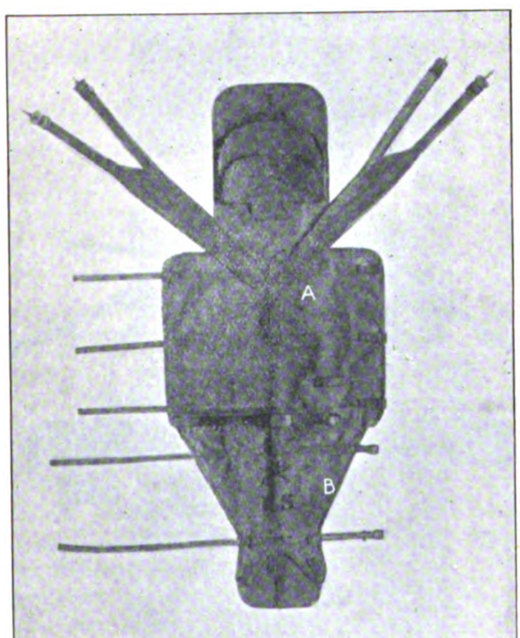

Fig. 1.
A, carrying receptacle. B, pack carrier opened out.

The larger rectangular piece, measuring 16 in. by 20 in. when packed with rations and necessaries, forms the knapsack proper and will be referred to as such. On its upper border is a short flap, on the outside of which is laced a canvas pocket for the mess tin. Three web straps, placed laterally, fasten to tongueless buckles on the opposite side thus closing the sack (see fig. 1). Attachable to the lower border by a leather coupling strap is what

is known as the "pack-carrier," in shape a truncated cone, the apex downwards ending in two peaks, each carrying a small metal D. Secured in this by two web straps engaging in tongueless buckles are carried, in a bundle, the blanket, poncho, and shelter tent portion.

Braces or suspenders are sewn diagonally to the upper border of the knapsack. These are made of canvas $3\frac{1}{2}$ in. wide where

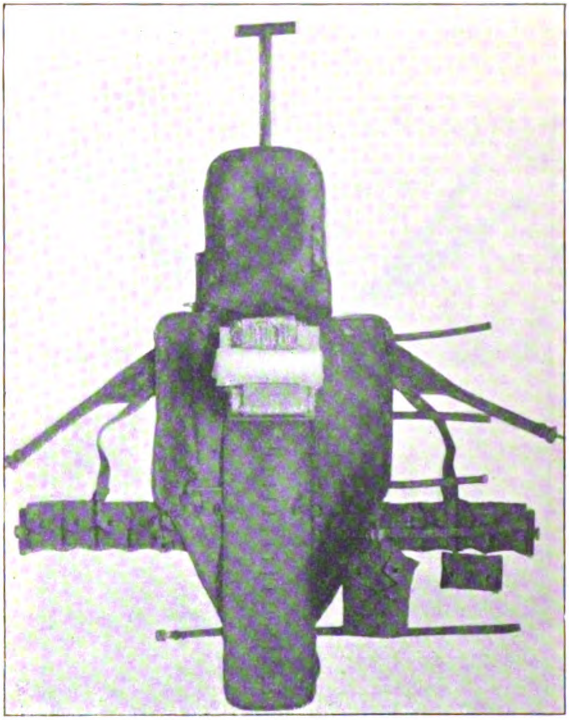

FIG. 2.—To show rations, &c., in position.

they cross the shoulder and pass under the axilla. It is claimed that this breadth under the effect of tensile strain will cause the edges to turn up or curl, and thus present a curved surface conforming to the part of the body under pressure. Their free ends carry a swivel for attachment to the D's on the pack-carrier or knapsack when the former is discarded. At the level of the axilla in front an adjustable web strap is sewn to the under surface of the brace, this carries a hook which engages in one of the

numerous eyelet-holes along the upper edge of the belt. Further, there is attached to the centre of the knapsack at the back an adjustable web strap, also carrying a hook which connects the knapsack to the belt behind.

Attached to the middle of the interior of the knapsack is a long piece (24 in.) of canvas, $7\frac{3}{4}$ in. broad, which is for wrapping round the contents of the knapsack and securing them in position. On each edge about the centre of the strip is a D to which is attached the brace swivel when the pack-carrier and contents have been removed (see fig. 2).

FIG. 3.—To show the position of the belt.

The belt, made of webbing, in breadth $2\frac{1}{2}$ in., only differs from that of the 1908 equipment in that its length adjustment is at the back, and that it has one more cartridge pouch on it. It is worn well down over the hip bones on the side and below the pit of the stomach in front (see fig. 3).

To the belt are attached the water-bottle and first field dressing pouch. The entrenching tool is secured to the outside of the knapsack in a vertical position and the bayonet scabbard is attached to the right-hand top corner of it. All these articles are attached by what is called the "double hook attachment," and provision is made for attaching scabbard and entrenching tool to the belt if necessary.

The hook is constructed so as to enter and bear equally upon two adjoining eyelet-holes, the swinging motion to the front and rear being thereby entirely eliminated, and the attachment being broad and short admits of secure fastening, and the lateral motion

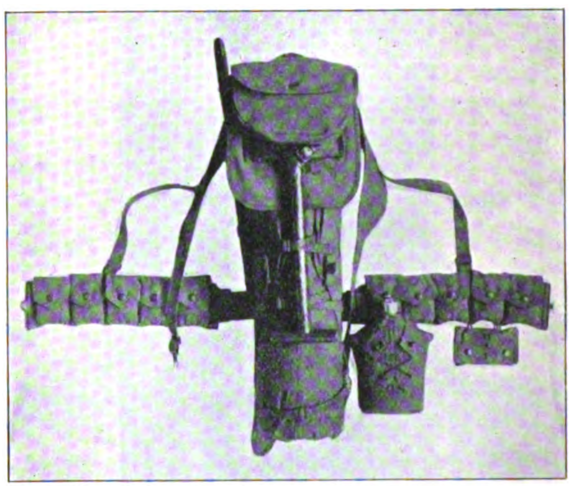

Fig. 4.—Equipment packed ready for wear.

is reduced to practically a negligible quantity. The character of the hooks at both ends is such as to admit of ready attachment to, or disengagement from, the belt or other place of attachment, but still insures absolutely against loss.

The water-bottle is a great improvement on that of 1908. It is flask-shaped, made of aluminium and seamless, with a capacity of 24½ oz., and closed by a screw top secured by a chain. The bottom is flat and a cup fits over the lower end. The nested water bottle and cup are carried in a canvas felt-lined receptacle; this cover is closed and fixed in position by two turnscrews.

To pack the knapsack the six packages of rations and necessaries

are arranged in two layers, their lower edge on the line of attachment of the inside flap, which is folded over them. The lateral sides of the knapsack are in their turn folded over and secured by the upper two binding straps. The "pack" (blanket, poncho, and shelter tent portion tightly rolled), a bundle more or less cylindrical, some 20 in. long and from 6 to 8 in. in diameter, is inserted into

FIG. 5.—Back view of equipment in position.

FIG. 6.—Side view of equipment in position.

the "pack-carrier" and pushed up into the lower part of the knapsack, being secured in position by the two web straps of the "carrier." The short flap carrying mess tin and entrenching tool is turned down over all, and the lower binding strap of the knapsack secures the handle of the entrenching tool in a vertical position.

When the "pack-carrier," with contents, is coupled to the

loaded knapsack, we have a compact and semi-rigid bundle, the component parts of which are readily separable. By simply withdrawing the coupling strap the "pack-carrier" can be detached, this containing what are called the "non-essentials" leaves the man with the essential part of his kit (see fig. 4).

The complete pack reaches from the level of the shoulders to a point from three to five inches below the waist line. This bundle is held in a vertical position on the back by means of the braces. The loaded belt in front is the counter-balance, and the short strap at the back hooked to the belt serves to steady the load. The load thus hangs from the shoulders and conforms to the general line of the spine, a portion of its weight being taken up by friction and being roughly cylindrical in shape presents a minimum of surface in contact with the back and shoulders (see figs. 5 and 6).

It is claimed that when the soldier seats himself all pressure and weight is at once removed from the body.

The new equipment packed weighs about 41¼ lb., a saving of some 5¼ lb. compared with the old, although ten extra rounds of ammunition are carried. Removal of the "pack-carrier" and contents reduces the weight to 32 lb., this is called the "normal equipment."

The description and photographs are from an actual set of this equipment in the Museum of the Royal Army Medical College. Details as to packing and method of wearing have been obtained from the *Journal of the United States Infantry Association*, September and November, 1910.

PRACTICAL HINTS ON MARCHING AND HEALTH ON ACTIVE SERVICE.

By G. FAHEY.
Late 88th Connaught Rangers.

(*Continued from p.* 418).

PART IV.

THIRST ON THE MARCH.

Amongst the many discomforts which the soldier has to contend with whilst on the march, and the temporary relief of which is fraught with so much danger, is thirst. The craving for water and other liquids on the line of march varies in its intensity in different individuals. Many men are able to complete a long and fatiguing march without once indulging in a drink of any kind whatever, whilst others can scarcely march a few miles before their water bottle is emptied; after which at each halt they besiege the regimental water barrel, or patronize the "fizzer wallahs," or vendors of cheap mineral waters, &c., who invariably accompany a regiment on the march at home.

Having been able to make a particular study of the type and habits of different men in relation to their ability to restrain themselves from drinking on the march, I have come to certain conclusions which I will endeavour to describe for the benefit of all young soldiers who value their health, and who wish to maintain their military efficiency—from a physical point of view—under the hazardous conditions imposed on them, either on manœuvres or on active service.

It is a well-known fact that impure water is one of the chief causes of enteric fever; in fact so much attention has been bestowed on the importance of pure water by the medical authorities, in their endeavours to combat this great scourge of modern armies in the field, that it would appear that impure water is the greatest, if not the sole cause of enteric. I feel fully justified, therefore, in urging on my readers the importance of accustoming themselves to the habit of going for long periods on the march without liquids, with a view to minimizing the danger of contracting this disease.

Not only for hygienic reasons is it desirable to be able to control the desire for drink on the march: but it is also of benefit in other ways. On some of the long marches in South Africa, the officers had the greatest difficulty to restrain men from leaving the ranks to drink filthy and polluted water, sometimes from stagnant

pools or dams on the veldt. The orders were very stringent on this subject, yet some men unable to restrain themselves at the sight of water in any form would run out of the ranks, a proceeding which invariably brought them heavy punishment.

The most frequent indulgers in drinks whilst on the line of march, strange to relate, are total abstainers from alcohol. I do not state this fact with any desire to discourage total abstinence, but I do think that temperance societies, especially the Army Temperance Society, should endeavour to point out to its members that temperance, or total abstinence from alcohol, should not mean an immoderate use of all other liquids or beverages, and that there is sometimes a greater danger to their health lurking in the innocent-looking glass of clear water, or the bottle of cheap mineral water, than may be contained in the beverage from the use of which they have promised to abstain.

Heavy drinkers, or those addicted to over indulgence in alcohol, come next, though many of these, through a rooted contempt for water or minerals, overcome their thirst, or preserve it, with a view to better enjoying their favourite beverage when the camping ground is reached, and the canteen opened. I have known many a hard drinker who, when in camp or barracks, was seldom without being more or less under the influence of drink, still retain his aversion to water whilst on active service and unable to indulge in alcohol, was more moderate in the use of water than the avowed abstainer.

The moderate drinker, accustomed as he is to moderation in the use of alcohol, is usually moderate also in the drinking of water, and does not suffer so much from the desire to drink frequently and copiously, as either of the two former.

Non-smokers, however, come easily first in the ability to resist the craving for drinks, or rather should I say the desire to drink on the march is not so intense in them as it is in their comrades who smoke. Many virtues have been claimed for the fragrant weed. It is attributed with the power to soothe the tired and troubled mind, soften the temper, allay the pangs of hunger, and many other beneficial powers, none of which I am going to question; but that it lessens the desire for drinking, or that smoking strong tobacco either before or on a march under a tropical sun is anything but harmful to the smoker, I have never been able to justify from my experience of the habits of the men I have marched with.

No one, except he be a bigoted non-smoker, who has had experience of active service, can deny that tobacco, when used at

the proper time, is beneficial. It is the soldier's greatest solace and comfort in camp, bivouac and, when permitted, in the hospital.

When the relieving force marched into Ladysmith through the lines of gaunt and half starved men of the garrison, the first thing they asked us for was not food, but tobacco. Unfortunately we were not able to help them, as we were as badly off for the precious weed as themselves, having been unable to procure any during the ten days' continuous operations we had been engaged in since leaving the last camp at Chieveley.

So it was even with the wounded. When help came, their first cry was for water, and the next was for a cigarette or a smoke of any kind. Yes! there is no doubt about the influence of tobacco on the spirits of the soldier on service. You may curtail his bread, biscuit or meat ration, take away his allowance of rum, or deprive him of his tent and blankets, and you do not affect his spirits, but if you fail to keep him supplied with tobacco you go a good way towards making him a depressed and unsatisfied individual.

Smoking, however, has its demerits as well as its advantages. It is usual amongst most hard smokers to light their pipes immediately on rising—that is if they have not been indulging in it whilst lying awake before réveillé. Then they have another smoke after breakfast; and for the first mile or two the pipe is kept going. These are the men, I invariably noticed, who always had their water bottles emptied the first, and were asking for drinks from the bottles of their more careful comrades.

By drying up the salivary glands, smoking creates an intensified desire for water, when acting in conjunction with a hot sun, a dusty road, and the fatigue of marching with a service load; so that the craving for water in these men was but the sequence of the early morning smoke.

You will see very few men smoking after the first eight or nine miles have been accomplished, and the sun pouring down its fierce rays on the dusty column. It is in the early cool of the morning that the harm has been done, when the pipe or cigarette has been too freely indulged in.

During our long marches in South Africa, I have often been asked how it was that I was always able to reach the end of the longest march with my water bottle still three parts full. I had gained a certain reputation for this, so that at the end of each march, when the water carriers were detailed from each section to fill the bottles—a proceeding which usually entailed another walk of a mile or two—there would be a rush for my bottle, not so much for the honour of filling it, as for the water they knew it contained

to quench their thirst before setting out on their tramp to the watering place.

I have always attributed my immunity from thirst to the fact of my not smoking, and those who have taken my advice, and curtailed or discontinued their morning smoke, have invariably informed me that it lessened their desire for water.

It is remarkable how easy it is, with a little persistency and exercise of will power, to overcome the desire for water in the early stages of the day's march. If a man will make up his mind not to give in to the first symptoms of thirst by slaking it from his water bottle, he will find that the desire will gradually wear off, so that whilst he may have felt thirsty after the first mile or two, the thirst, instead of increasing, has diminished.

Constant tippling at the water-bottle, especially at the beginning of a march, only aggravates the thirst, and leaves the drinker still unsatisfied. A few minutes after each drink if the sun is hot, and the roads dusty, the thirst is as insatiable as before, whereas had he left his water-bottle alone, he would have found that the first thirst had worn off, and left him with little desire, if any, for water.

That it is possible, by the exercise of the will to overcome the initial cravings for drink on the march, I am quite confident, both from my own experience and from that of other men I have marched with and advised on that point.

It would be useless, however, to ask any man past a certain age, who had been used all his life to immoderation and the slaking of his thirst at its first and every call, to attempt this control. It is the young soldier, for whom these pages are written, that I would ask, in his early soldiering career, to practise the exercise of control over drinking on the march.

He will have many opportunities ; on field days, route marching, and manœuvres. Let him endeavour to accustom himself to the habit of overcoming the first false thirst, that ensues when only a short while on the road, and of marching as far as possible without drinks of any sort.

Resist the blandishments of the "fizzer wallahs" and vendors of cheap drinks, when they appear on the line of march. These drinks only create a stronger thirst, and are not always obtained, or manufactured from a desirable source. When you are really thirsty, drink sparingly of the water provided in the regimental water barrel, or of what you may be carrying in your bottle. When the mouth is parched and dry, if you take a mouthful of water and roll it about in your mouth a while, then throw it out again, you will find that it sometimes relieves the thirst as well as if a deep

draught had been taken. It was my habit, when I found I could do no longer without a drink, to keep each drop of water in my mouth for a while before swallowing it. That was when water was scarce, and I found that it satisfied me as well, and made my allowance of water last longer.

If you continue to practise the habit of controlling the desire for drinking liquids on the march, the habit will grow on you, till you can accomplish the longest day's march, without a drink of any kind or without any intense desire for the same.

When you have reached this stage, it will go a long way to insuring you good health and ability to resist the ravages of disease in any country you may find yourself quartered in, or on any campaign it may be your luck to take part in.

There is more disease caused, especially in tropical countries, by the immoderate use of water and other liquids than by any other means.

Wine, beer, spirits, water, minerals, tea, coffee and all other beverages, when used to excess, are one and all as bad as each other, whilst each when drunk in moderation may be beneficial. Let moderation in all things be your motto and apply it specially to the indulging in liquids if you wish to retain your health in tropical countries.

PART V.

MUSIC AS AN AID TO MARCHING.

Singing has often been recommended as a means of keeping up the spirits of the men, enlivening the weariness, and soothing the bodily fatigue, consequent on the performance of prolonged marches, thereby adding to the marching efficiency of a regiment. Marching songs, psalms, and even the latest Music Hall ditties, have all had their advocates. Only recently a suggestion has been made that choral classes be formed amongst the various regiments quartered at Aldershot, with the object of encouraging the singing of songs and choruses on the march.

As a means of developing the lung-power on short practice marches, in cool weather, singing together and in rhythm with the step would certainly be of advantage. Vocal efforts on the march may be all very well in this way, or on occasions, such as going or returning from a bathing parade, on a short winter route march, or when marching through the cool glades or shady lanes of England, during the autumn manœuvres.

I doubt, however, if the singing of marching songs or choruses, under a tropical sun, across stretches of sandy plains, would be of

any benefit. I have always found that the man who kept his mouth closed, breathing steadily through his nostrils, was the man that marched well. Singing interferes with the natural steady breathing, allows dust to enter the lungs through the throat, dries the salivary glands, causing a desire for more water, and altogether adds to the general fatigue of the body. Even conversation, when carried on to excess in the ranks is, in a way, detrimental.

Whilst marching with my company on an unusually hot and sultry day in South Africa, enveloped in clouds of fine dust, and hearing no sound for miles but the deep breathing of the men as they plodded silently on, I have always known they were marching well—you cannot march for any length of time and talk, not to mention sing—not under an African sun, anyway—amidst clouds of dust thrown up by transport animals and the feet of the marchers.

Regimental bands, I need hardly say, are of the utmost value on the march, and the music is highly appreciated by the men. All old soldiers, whether regulars or volunteers, will remember the thrill they have experienced, when towards the close of a long day's march, the band has struck up a lively and familiar air. How they have pulled their tired bodies together, straightened out their shoulders, and stepped smartly out to the music.

All regiments have some favourite march—not necessarily the regimental one, the playing of which by the band never fails to enliven, or to use a familiar expression, to "buck up" the men, no matter how tired or wearied with hard marching they may be. In my regiment, the favourite was "Brian Boru's March," and whenever the men were beginning to show signs of weariness on a long march, the striking up of the first few bars of this inspiriting march was always responded to by a squaring of shoulders, a straightening of tired bodies, and a series of ear-splitting Irish yells, culminating in one long and loud "Hurrish" as the band sustained a pause note in the middle of the march.

A good deal of music, however, is wasted on the march by playing over rough and uneven ground, up hills, and through narrow lanes where the column has to stretch out considerably.

Playing under these conditions, besides being very distressing to the bandsmen, is the cause of much "grousing" amongst the men, as they try to keep step to the jerky music, while dodging stones, ruts, and mounds of earth in their path.

The band should never be ordered to play unless there is a fairly clear road to march over, when its music can be appreciated

and the keeping of the step to the same is a relief, instead of adding to the distress of the column.

Regimental band music was seldom heard on the march during the South African campaign, for the reason that the band instruments were collected at the base of operations, and with the exception of a few regiments, they were not issued again till the end of the war; the bandsmen either being employed as regimental stretcher-bearers, or taking their place in the ranks.

Some regiments, however, retained their drum and fife bands and used them whenever it was considered that the dispositions of the enemy's forces would permit of music being played on the march. That this music was highly appreciated by the men, and also a great aid to their marching, there is not the slightest doubt, though personally I cannot vouch for its good effects, as I was never fortunate enough to march behind a band of music during the campaign.

Highland regiments, in common with all Scottish regiments, are the most fortunately situated in respect of music on the march, for they are never without their pipers in war or in peace. The Highland pipe has the advantage over other wind instruments that it can be played singly and for a long period without undue distress to the player. One piper can play for his company should they be detached from their regiment, for long periods throughout the day's march, and it is very unusual to see a company on service without its piper. This fact has a lot to do with the good marching powers of our Highland regiments, and I am of opinion that if Highland pipes were more extensively used in the service they would be of assistance in maintaining a high standard in marching.

The pipes are already in use in the Indian native army, notably in the Ghoorka regiments, and in the Egyptian army. The Soudanese regiments also possess their corps of pipers, so that the instrument is not altogether the monopoly of Scottish corps.

Irish regiments in particular should possess a corps of pipers, as they have a national claim to the instrument as well as the Scotch, the Irish war pipe having claims to antiquity as great as the Highland pipes. I look forward to the day when all Irish infantry regiments will possess a band of their old Irish war pipes in lieu of the drums and fifes, so convinced am I of the great service and utility of the pipes as a means of supplying music on the march, especially on active service.

Whilst writing these lines I have been interested in an announcement that the Royal Navy have sanctioned pipe music at the Royal Naval Barracks in Portsmouth.

United Services Medical Society.

THE MEDICAL SERVICE WITH LORD METHUEN'S FORCE DURING THE ADVANCE ON KIMBERLEY, 1899.

By Lieutenant-Colonel C. H. BURTCHAELL.
Royal Army Medical Corps.

(*Continued from p.* 433.)

Halt at Modder River, November 29 to December 9.

When the Boers retreated on November 28 they left behind a field hospital, which was established at a house close to the drift north-east of Modder River railway station. It was in charge of Dr. A. E. W. Ramsbottom[1], M.D., F.R.C.S.I., Principal Medical Officer of the Orange Free State Forces, who had with him four or five medical officers of various nationalities, and about thirty subordinate medical attendants. The house was surmounted by a Red Cross flag with the National flag of the Free State, and the conditions of the Geneva Convention were, apparently, observed in all respects. The only peculiarity in the situation was that the medical attendants seemed to be greatly in excess of the requirements of the half-dozen or so wounded left in their charge.

At that time very little was known about the Geneva Convention, and, contrary to the opinion expressed by Colonel Townsend, the whole of the captured personnel was sent under escort to Cape Town on November 30, and their vehicles were distributed to various units. On arrival at the Cape the authorities at Army Headquarters decided that they had been wrongly detained and sent them back to Modder River. They arrived there on December 9, and left for Jacobsdal the same day.

On settling down into camp at Modder River there was a serious shortage of stretchers, and many men were without first field dressings. Steps were at once taken to get back the stretchers which had been sent to Orange River with wounded after the actions on November 25 and 28, and telegrams were despatched to Cape Town asking for a reserve supply of stretchers and for first field dressings. These are points of importance, as there was always a

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[1] Now the Hon. A. E. W. Ramsbottom, Administrator Orange Free State, Union of South Africa, and late Colonial Treasurer, Orange River Colony.

loss of stretchers when seriously wounded were transferred to the line of communication in railway trucks, and as often as not the number of first field dressings used was much larger than the number of men actually wounded.

In consequence of some correspondence with the enemy on the subject of supposed deliberate firing at ambulance wagons, and as the only distinguishing mark on these vehicles was a small red cross painted on the fore part of the side of the body, large Red Cross flags were made and fixed on poles, which were erected on the wagons.

December 4.—Forty sick transferred to Orange River by ordinary train.

December 6.—Colonel Young, Commissioner for the Red Cross Society, arrived with sixty-eight cases, containing various articles for sick and wounded.

The 12th Lancers (Major T. J. O'Donnell, R.A.M.C.), "G" Battery R.H.A. (Lieutenant G. Delap, R.A.M.C.), and 2nd Battalion Black Watch (Lieutenant H. E. M. Douglas, R.A.M.C.) also arrived.

Two officers and seventy-six other ranks transferred sick to Orange River.

December 7.—The following arrived: 2nd Battalion Seaforth Highlanders (Major Moffit, R.A.M.C., who transferred charge to Lieutenant H. Ensor, R.A.M.C.); Field Hospital (Major W. H. Murray, R.A.M.C.) and Bearer Company (Lieutenant-Colonel E. B. Hartley, V.C., Cape Volunteer Medical Staff Corps) for Highland Brigade.

In the early morning a strong force of the enemy under Prinsloo, with three guns, attacked two companies 2nd Battalion Northampton Regiment holding Enslin. They destroyed the railway and cut the telegraph wires, but withdrew on arrival of the 12th Lancers and 62nd Battery R.F.A. from Modder River, followed by an armoured train carrying Seaforth Highlanders and half the Cape M.S. Bearer Company. The Bearer Company returned to Modder River with the troops and brought back nine wounded from this fight.

December 9.—At dawn the Naval 4·7-inch gun, under escort of Cavalry and R.H.A., fired on the Boer position at Magersfontein from the Gangers' Hut, three miles north of Modder River. No casualties.

Seven officers—including two wounded on 28th at Modder River action—and sixty-nine other ranks transferred to Orange River.

The 65th Howitzer Battery R.F.A., and 1st Battalion Gordon Highlanders (Captain P. J. Probyn, R.A.M.C.) arrived.

Two officers of the German Army Medical Service, Stabsarzt Dr. Schmidt, Royal Prussian Guarde-Füsilier Regiment and Stabsarzt Dr. Krummacher, Kaiser Wilhelm Academie, also arrived and joined the Guards Brigade Field Hospital.

Battle of Magersfontein.

When his last reinforcements were ready Lord Methuen decided to continue his advance to Kimberley and attack the Magersfontein Kopje. With this purpose he gave orders for the kopje to be bombarded from 4.50 p.m. to 6.40 p.m. on December 10 with all his guns, including the Naval 4·7 inch. At daybreak on December 11 the southern end of the kopje was to be assaulted by the Highland Brigade, supported by all the guns, their right and rear being protected by the Guards Brigade.[1] The camp at Modder River was to be garrisoned by the half battalion of the Loyal North Lancashire Regiment, details of various corps, and the greater part of the Naval Brigade with its four 12-pounder guns.

The troops to move forward were divided into three columns: No. 1 Column—consisting of the 9th Lancers, Mounted Infantry, "G" Battery R.H.A., 18th, 62nd, and 75th Batteries R.F.A., 65th Howitzer Battery, Highland Brigade, Highland Brigade Bearer Company, 2nd Yorkshire Light Infantry—was to march at 3 p.m. on the afternoon of December 10 towards the southern end of Magersfontein Hill. The main body of Infantry to halt behind Headquarter Hill; the 2nd Battalion Yorkshire Light Infantry to proceed to Voetpad's Drift and entrench there against attack.

No. 2 Column—consisting of the 1st Battalion Northumberland Fusiliers and part of the Naval Brigade—was to move out with the 4·7-inch Naval gun, which from a position west of the railway was to co-operate with the Artillery engaged in the bombardment; Rimington's Guides were to protect the left of this column.

No. 3 Column—consisting of the 12th Lancers, 7th Company R.E., Guards Brigade Ammunition Column, Guards Brigade Field Hospital, Guards Brigade Bearer Company, Highland Brigade Field Hospital, and Divisional Troops Field Hospital—was to be, by 3 a.m. on the 11th, 500 yards to the left rear of the ground occupied by the brigade division of Field Artillery in rear of Headquarter Hill.

The supply column, with five days' rations, under escort of a half-battalion of the Gordon Highlanders, was, at 4 a.m. on

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[1] Lord Methuen's despatch, *London Gazette*, March 16, 1900.

the 11th, to follow the route taken by the Highland Brigade for 2 miles.

December 10.—At 3.15 p.m., No. 1 Column moved out of camp in drizzling rain. The Highland Brigade halted near Headquarter Hill. With the cavalry covering the front, the Black Watch advanced in extended order and later on fell back when the guns opened fire. Magersfontein Hill was bombarded for an hour and a half. At 6.30 the guns ceased fire, and the artillery and cavalry fell back to Headquarter Hill. One ambulance under Lieutenant Fell, from the 9th Brigade Bearer Company, accompanied No 2 Column to the Gangers' Hut on the railway and bivouacked there during the night.

The 9th Brigade Bearer Company and Field Hospital remained at Modder River.

The Guards Brigade with its Field Hospital and Bearer Company crossed the drift (north-east of Modder River Station) from the camp on the "Island" after dark and bivouacked on the north bank of the river.

The Highland Brigade and Divisional Troops Field Hospital packed up and prepared to join No. 3 Column.

December 11.—At 1 a.m. the troops of No. 3 Column marched from Modder River for the appointed rendezvous. The night march of the Highland Brigade towards the Boer position commenced a few minutes after midnight in rain and intense darkness. The Bearer Company remained with the guns at Headquarter Hill to await developments.

The brigade marched in mass of quarter columns, the four battalions keeping in touch by using connecting ropes. The Black Watch led, followed by the Seaforth Highlanders, Argyll and Sutherland Highlanders and Highland Light Infantry, in rear. Just before daybreak, about 4 a.m., the brigade was within a few hundred yards of the trenches at the foot of Magersfontein Hill. The leading battalion was thrown into some confusion in the dark by a very thick bit of bush 20 to 30 yards long. The Seaforth Highlanders went round this bush to the right and was getting into its original position behind the Black Watch when the order to extend was given. The Seaforth Highlanders and two companies of the Argyll and Sutherland Highlanders were in the act of doing so when suddenly a severe fire was poured in by the enemy. The casualties were heavy, Major-General Wauchope was killed. The brigade was more or less disorganized, but mixed parties of various battalions got to

within 200 to 300 yards of the enemy, lay on the ground and opened fire. Some passing round to the right captured the Scandinavian contingent,[1] and about 100 men of the Black Watch and Seaforth Highlanders got well round the eastern face of the enemy's position. Attempts to advance were unsuccessful and the attack came to a standstill.

At 4 a.m. the 12th Lancers "G" Battery R.H.A. and the Mounted Infantry moved north-east against the enemy's left flank, but were temporarily stopped by fire from the low ridge running from Magersfontein Hill to the Modder River. "G" Battery advanced at a trot under fire. The guns were run up by hand to a position on the reverse slope of Horse Artillery Hill, where they continued in action for twenty-four hours. Two dismounted squadrons of the 12th Lancers and parties of M.I. advanced through the guns, and held the ridge on the enemy's side of the dead ground, immediately in front of the guns.

The 9th Lancers were sent along the river, but could not get beyond Moss Drift.

At daylight the Artillery opened fire on Magersfontein Hill, the Naval 4·7-inch gun from a position west of the railway, near the Gangers' Hut.

The Guards Brigade—No. 3 Column—arrived at Headquarter Hill about 3.30 a.m.

The Scots Guards were detailed to act as escort to the Howitzers and Field Artillery and, when it was known that the Highland Brigade attack had failed, the two battalions Coldstream Guards, with the Grenadiér Guards in reserve, were advanced towards the low bushy ridge due east of Headquarter Hill. On arrival there they found a strong force of the enemy in front of them.

The 1st Battalion Coldstream Guards on the right extended to within 2,500 yards of the river, from which point the line was prolonged by the 9th Lancers and M.I.

Half a company 2nd Coldstream Guards moved to the left to get into touch with the right of the Highland Brigade, passed the battery at Horse Artillery Hill, and arrived at the ridge beyond about the same time as the M.I. and 12th Lancers entered the dead ground in front of the guns.

At 6 a.m. the 2nd Coldstream Guards, followed later by two

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[1] Shown on the map in centre of space between position of 2nd Coldstream Guards and Magersfontein Hill.

companies 1st Coldstream Guards, moved forward towards the right of the Highland Brigade.

The position occupied by the dismounted 12th Lancers and M.I. opposite the enemy on the northern end of the low ridge was later in the day taken up by portion of the 2nd Coldstream Guards, which held it until the next morning.

Two companies of Grenadier Guards reinforced and connected the 2nd and 1st Battalions Coldstream Guards in the firing line extending from near Magersfontein Hill towards the river. On that line many of the Guards, dismounted Cavalry and M.I. were fighting all day at exceedingly short ranges; in some cases only a few hundred yards of bush separated them from the enemy.

About 9 a.m. an attempt to turn the right of the Guards Brigade was checked by the O.C. K.O.Y.L.I., who advanced with five companies towards Moss Drift and held the ground between the left of the Guards Brigade and the river.

From an early hour the Highlanders in front were only able to hold on to their places by the support of the guns, which had the effect of considerably reducing the rifle fire along the centre.

About 11 a.m. four companies of the Gordon Highlanders, followed later by two other companies of the same battalion, began an advance against the trenches and reached positions varying from 300 to 400 yards from the enemy on the west of the south-eastern point of the hill.

About 2 p.m. the Highland Brigade fell back some few hundred yards and lay down, and about 5 p.m. fell back further and reformed in rear of the guns. Six companies of the Scots Guards took up positions about 1,100 yards from the trenches in front of the 18th and 62nd Batteries R.F.A.

After 5 p.m. there was but little firing, except an occasional skirmish on the right flank. At night the greater part of the troops on the right flank and in front remained in the positions they occupied during the late afternoon.

The 9th Brigade was not engaged during the day.

The casualties during the action, including a few which occurred during the evening of the December 11 and morning of December 12, were :—

	Killed	Wounded	Total
Officers	20 ..	46 ..	66
Other ranks	149 ..	646 ..	795
	169	692	861

Of the above, 7 were not admitted to hospital; 2 officers and 20 other ranks died in the field hospitals, and 21 other ranks returned to duty in the field. The strength of the troops engaged, excluding the 9th Brigade, was about 11,447.

A number of wounded Boers—mostly Scandinavians—probably 25 or 30, were dealt with by the field hospitals. The Highland Brigade, including the Gordon Highlanders, lost 16 officers and 135 others killed, and 32 officers and 534 others wounded—a total of 151 killed and 566 [1] wounded. The Black Watch lost 73 killed and 228 wounded; the Seaforth Highlanders, 41 and 146; the Highland Light Infantry, 12 and 85; the Argyll and Sutherland Highlanders, 21 and 71; and the Gordon Highlanders, 4 and 36.

The Guards Brigade lost 11 killed and 81 wounded: 1st Coldstream Guards, 8 and 51; 2nd Coldstream Guards, 2 and 23; 3rd Grenadier Guards, 1 and 5; and 1st Scots Guards, 0 and 2.

The Cavalry, Artillery and Mounted Infantry lost 6 killed and 40 wounded, out of which the 12th Lancers lost 3 and 18, and the 9th Lancers 1 and 10. The remaining casualties, 1 killed and 5 wounded, occurred amongst the Staff and Royal Army Medical Corps.

Regimental Medical Service.

The Black Watch.—Lieutenant H. E. M. Douglas, R.A.M.C.: When the battalion deployed on the afternoon of December 10, the regimental stretcher-bearers were told off to follow their respective companies. We soon retired on the main body. There were no casualties.

At midnight of December 10—11 the Highland Brigade moved towards the south-east of the ridge of the kopjes of Magersfontein.

Before marching off for the night attack I detailed the stretcher-bearers to their respective companies, and told them that when the battalion deployed they were to keep in touch with their companies, and if they attended or collected any wounded they were to try and find my position and then to send or bring the wounded to me.

Just before daybreak, as the leading companies of the Black Watch and Seaforth Highlanders were deploying, heavy firing was commenced by the Boers, which caused a certain amount of confusion in the Brigade, resulting in the various units getting mixed up.

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[1] In some of the published returns wounded who died soon after admission to the field hospitals are shown under "killed."

Individual efforts were afterwards made to deploy to the left. Marching on the left of the rear company, I was carried to the left in the efforts to deploy in that direction. During the remainder of the day I attended the wounded of the Brigade, at a distance of about 200 to 600 yds. from the Boers. During no part of the day did I get in touch with any stretcher-bearers of the Brigade, but they did their work well, as several of them subsequently received the Distinguished Conduct Medal for their behaviour that day.

The wounded whom I attended to were instructed by me to lie still until the firing ceased or eased off; those able to walk were told to get back to Modder River Station, or if they saw a Bearer Company to go to it; those unable to walk were made as comfortable as possible, and assured that I would return later in the day, and take them to hospital. I did not actually see any squads of stretcher-bearers from the Bearer Company during the day, but I know that they removed some of the wounded, that I had attended to, soon after I had left them. At about 11 a.m. I saw, about a mile in the rear, what I considered to be the dressing station of the Bearer Company; after this I directed all slightly wounded cases to go in that direction.

Before starting, I had made up a concentrated solution of morphia, which I gave hypodermically to all the seriously wounded cases; I told them that I would come back to pick them up as soon as the firing stopped. The morphia appeared to ameliorate their misfortunes considerably.[1]

2nd Battalion Seaforth Highlanders.—Lieutenant H. Ensor, R.A.M.C.: On the morning of December 10, 1899, we were warned by Lieutenant-Colonel Hughes Hallett, commanding the battalion, that we were to move out of camp early in the afternoon and march with the Brigade towards the Boer position. The regimental stretcher-bearers, all bandsmen, sixteen in number, with Band-Sergeant Hoare, and a lance-corporal, were under my orders. We marched slowly towards the Boer position, and halted while the artillery shelled the supposed site of the enemy's trenches. This went on until nightfall, when we were ordered to lie down where we were, and get what rest we could until midnight, when the Brigade was to advance to attack the Boer position at dawn. At midnight we fell in, and the Brigade advanced towards the enemy, each battalion in mass of quarter column, the Black Watch leading,

[1] Late in the afternoon Lieutenant Douglas was severely wounded by a shell. He was sent back direct to Modder River in a Scotch cart.

followed by the Seaforths, Argyll and Sutherland Highlanders and the Highland Light Infantry. At the first sign of dawn the Brigade was halted, and the leading companies deployed; before the other companies could do so a single shot was fired from the Boer trenches, which we had unknowingly almost walked into. An extremely heavy fire followed. We lay down, and the order was given by Lieutenant-Colonel Hughes Hallett to fix bayonets. This was done, but in a few seconds the men, apparently of their own accord, rose up and extended in a mass to the right and left. In the confusion I lost my stretcher-bearers, and with the exception of Band-Sergeant Hoare did not see any of them during the day. In about half-an-hour it was quite light enough to see everything distinctly, and I did what I could for the numerous wounded who were on the ground. Fortunately before leaving the regimental transport I had filled my own haversack with bandages and packages of lint. These came in very useful, and owing to the wounded all belonging to kilted regiments it was possible to dress injuries of the legs very quickly, as no time was expended in ripping up trousers or taking off putties. The first field dressings carried by the men were extremely useful, and in most cases were all that was required. During the course of the morning I worked along the right of our line, and came upon some mounted infantry mixed up with the Highlanders. Here I found the Cape Medical Staff were doing most excellent work. When I came upon them the stretchers they had at their disposal were already being used for the carriage of wounded to a dressing station about 1,000 yd. in rear, but the men not engaged in carrying were, under the command of one of their junior officers, occupied in dressing the numerous wounded who had not yet been removed. I arrived at this part of the field about half an hour after the Scandinavian commando had been captured. Having obtained a further supply of bandages from one of the men of the Bearer Company, I returned again along our line and came on Lieutenant-Colonel Hughes Hallett. Near him were two wounded officers, besides several men, many of whom were hopelessly wounded. One of the wounded officers was shot through the body and the jaw, and was almost speechless. I dressed him as well as I could, and also the other wounded. Having noticed a folded stretcher lying on the ground at some little distance I ran to it, brought it up, opened it, and placed the officer on it. I then asked the men if any of them would volunteer to carry him down the slope to a less exposed place. Our men were replying vigorously to the Boer fire at the time. Two men immediately got

up, and carried him off under a really hot fire, which, however, did them no harm. Band-Sergeant Hoare took the other wounded officer, Captain Fetherstonhaugh, on his back, and carried him out of fire.

Having done all I could here, I went off to search for more wounded and met Douglas, who was attached to the Black Watch, on the same errand. We separated after a short conversation, and I never saw him again until the second day after, when he was in the hospital train going down to the base, severely wounded by a shrapnel bullet in the face. It was, as a rule, quite hopeless to remove the helpless cases even if we had stretchers and bearers, as the fire was too hot, and to attempt to do so would only have resulted in more casualties. The less severely wounded slowly worked their way to the rear by themselves, in many cases helping each other along. About midday I saw the Seaforth water-cart and the Scotch cart, which carried the medical and surgical panniers, advancing up the slope on the left of one of our batteries which was in action. I went to it, filled my haversack with dressings, and refilled my water-bottle, and then returned to the line where the wounded were. At this time the fire had died down somewhat, and it was possible to move about more freely. The advance of the Gordon Highlanders to reinforce the Highland Brigade then took place, and this revived the action. The day was very hot, and the chief sufferings of the wounded were from want of water, which in most cases it was impossible to relieve. About 3 p.m. the Brigade retired about 1,000 yards, and formed again. At this period the Boers opened fire with their artillery, but their shooting was very poor, and they burst their shells far too high. I retired with the Brigade, and found that I was again close to the Bearer Company. One of their ambulance wagons came up and advanced towards the Boer position to attempt to get in as many of the seriously wounded as might be possible; with it went Surgeon-Major W. Beevor, Scots Guards, who was then in command of the Divisional Field Hospital, about four men of the Cape Medical Staff, and myself. We soon filled it with wounded, but while engaged in putting in Colonel Downman and Captain Gordon, of the Gordon Highlanders, both of whom were seriously wounded, the Boers opened such a heavy fire that we had to send the ambulance wagon back. After this we separated, going up to the scene of action of the morning to continue the work of dressing as many of the wounded as we could find. A private of the Cape Medical Staff accompanied me, and we dressed

many wounded, but their great want was water, and our water-bottles were soon empty. I gave away all the morphia tablets in my dressing-case to the seriously wounded, but what was wanted was a solution of morphia for injection which could be given at once to wounded whom it was impossible to remove and I never afterwards went into action without a supply. While on this duty we got quite near to the Boer trenches, which were full of men; they soon noticed us, however, and drove us away with rifle fire. When it began to get dark we retired, and I rejoined my unit. The next morning the Brigade retired to camp at Modder River, and on arrival all the uninjured medical officers were at once put on duty at the Field Hospital to look after the numerous wounded.

1*st Battalion Argyll and Sutherland Highlanders*.—Captain J. E. Carter, R.A.M.C.: On the afternoon of December 10 we marched out about three miles from Modder River Station and halted while the guns bombarded the kopjes. It was raining heavily. At nightfall we bivouacked. Orders came round shortly to the effect that at 12 midnight we were to advance in quarter column until close up to the Boer trenches, then extend in double companies, 5 yards interval, A and B in front, C and D behind, and so on; on first approach of daylight, to storm the position with the bayonet. These orders were delivered by our O.C. to the officers.

We ate bully beef and biscuit and cautiously partook of water, as our water-bottles had to last us probably all next day; then we silently lay down and tried to sleep. At midnight we were quietly roused, and fell in, in pitch dark, and cautiously advanced. The regimental stretcher-bearers were ordered to follow the battalion later. Just then two men fiddling with their rifles loosed them off. Rain was again descending in torrents, a thunderstorm came on, and it was bitterly cold. It was so dark that as we marched we got into some confusion. One had to march touching the man in front. Somewhere about 4 a.m. we came under the Boer position, a high kopje rising up just in front; one could now just see the outline of objects and murmurs went round that we should get extended at once. The Black Watch which was leading received an order to extend, but the order never got to my position; we were the third battalion behind the Seaforths and in front of the Highland Light Infantry. It was generally believed that a red light was now shown on the Boer right, and immediately on its being extinguished a terrific fire was poured into the Brigade. When fired on we were huddled up like sardines. Being on the left rear of the battalion,

I could touch the "H.L.I." behind me. Some shouted "Fix bayonets," "Charge," and some of the Black Watch and parties in front did so; others were so huddled up they could not. Some shouted "Lie down;" others "Retreat." In the centre men fell over each other—five and six deep, but being on the left, I was not trodden on.

Soon I got under cover of scrub and found a few men scattered about. By this time the Boers' fire had practically ceased, except for some sniping. I came upon some wounded and dressed them up and sent them back. Our guns shelled the summit of the hill severely and so kept down the Boer fire from the top of the hill on our men who were lying under it. It was then about 5 a.m. and officers were rallying the men by getting hold of those next to them. Many were without rifles, which had fallen or else been knocked out of their hands. That many lost their rifles through no fault of their own is certainly true. My corporal lost the field medical companion, but he was in no way to blame.

Lieutenant Clarke helped with his machine-gun to account for a party of about fifty Scandinavians, killed, wounded, and prisoners; those not wounded got up, threw down their rifles, held up their hands, and ran at full speed up to our men.

The shelling of the hill was being continued all this time, and men, as they were rallied, were advanced up to about 500 yards from the Boer trenches. Here the men lay most of the day and there were many casualties.

I stayed up there until we were ordered to retire, the order being due to the fact that we were being enfiladed by our own men. There were a number of dead and wounded where we had been. Later, an ambulance went up and took some of the wounded away.

1st Highland Light Infantry.—Captain C. J. Mackenzie, R.A.M.C.: On December 10, Colonel Kelham, commanding the battalion, called all the officers together and told us that he had received orders that the Brigade would march massed in quarter column at about midnight to attack the enemy's trenches at dawn with the bayonet. When we advanced I had with me the regimental "sick corporal" (who was killed), with the surgical haversack. The bandsmen were detailed to act as regimental stretcher-bearers.[1]

[1] Corporal John D. F. Shaul, of the H.L.I. band, was awarded the Victoria Cross for conspicuous gallantry in dressing wounded. With the utmost coolness and deliberation he sat down next a wounded man and attended to him in spite of a hail of bullets which kept raining round him.

All officers were dismounted; the horses, water-carts, medical and surgical panniers, &c., being left in charge of the regimental quartermaster. All men carried their first field dressings and emergency rations, and water-bottles were filled. It was pitch dark and raining in torrents.

The battalion was rear of the Brigade, and our orders were to keep close up and follow the battalion in front of us. No talking was allowed, and I could only distinguish the officer marching next to me from the rest of the men by stooping down and seeing the shape of his helmet against the sky.

Just as dawn was breaking and before, as far as I know, any order had come for our battalion to extend, a regular storm of bullets was poured into the Brigade. It was of course a complete surprise, and the Brigade was thrown into confusion and many came back on us. The Colonel and others gave the order to lie down. Those of us who could did so, and were badly trampled on. It was here that a great number were killed and wounded, and the ground was strewn in every direction with men, rifles, helmets and stretchers.

Individual officers collected men as soon as possible, irrespective of the regiments, formed them into lines and advanced in extended formation, and lay down to await reinforcements. The work of getting the wounded back commenced immediately, but unfortunately the stretcher-bearers had got mixed up with everyone else; some had lost their stretchers and picked up rifles instead, and each man went where he thought best.

I lost my helmet and very soon got bowled over by the sun and want of food and water, and I had no recollection of how I was brought back to Modder River.

1st Gordon Highlanders.—Captain P. J. Probyn, R.A.M.C.: The battalion[1] moved from Modder River at 3 a.m. in rain, forming escort to the supply column.

We reached our rendezvous after daybreak just as the 4·7-in. gun commenced firing. Later on ambulance wagons carrying Highland Brigade casualties began to pass us, and wounded were straggling back in all directions. The Colonel assented to my

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[1] The whole of the band were trained as stretcher-bearers and in first aid for six weeks before the battalion left Edinburgh in November, 1899, and most of the men were very efficient in those duties. Also before sailing, some £25 were expended in purchasing extra drugs, dressings, &c.—probably under a mistaken impression that the authorized equipment was inadequate for all practical purposes.

going forward to give a hand. Taking Corporal Mackay[1] and the orderly with the Scotch cart to a clump of trees to left of the position of the field batteries, we set up a small aid station.

About 10 a.m. orders were received for half a battalion of the Gordons to move up in support of the Highland Brigade. The men were extended, and worked up to about 400 yards of Magersfontein Hill. The whole of the bandsmen stretcher-bearers (eight stretchers) were brought up in rear of this first half battalion, and were quickly engaged with wounded of the Gordons and other Highland regiments. The stretcher-bearers before long lost touch as they had to take the wounded long distances. The Gordons soon got well in advance of all other corps, but to the left front of them numbers of dead and wounded were lying about.

The regiment had to take whatever cover was available. The firing became very hot, and men were dropping on all sides. Corporal Mackay and myself were kept busy attending to scores of wounded besides the Gordons, and our dressings soon became exhausted. When possible men were directed to crawl back to the clump of trees, from which they were carted by the ambulance wagons of the Cape Bearer Company.

Late in the day, when there was a lull in the firing, Surgeon-Major W. Beevor and myself took two ambulance wagons towards the spot where Captain W. E. Gordon,[2] of the Gordon Highlanders, and Lieutenant Waterhouse, of the Seaforths, both severely wounded, were said to be lying. The Boers did not fire upon us when collecting these and other severely wounded, but soon our 4·7-in. gun burst some shells on the kopje, and just then we got several volleys from the kloof of the hill on our left. Unfortunately some of the bearers were hit. No doubt this was partly due to several combatants taking cover around the retiring ambulance wagons. Previous to this Colonel Downman was wounded; Captain

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[1] Now Captain J. F. Mackay, V.C. On December 11 "he was absolutely fearless in attending the wounded." Formerly a medical student of T.C.D., Corporal Mackay served with the Gordon Highlanders at Dargai, and later on in the South African War he was awarded the Victoria Cross for conspicuous humanity and brave conduct in attending to wounded at Crow's Nest Hill, near Johannesburg, in spite of being far from cover and within short range of the Boers.

[2] Captain Gordon (now Lieutenant-Colonel Gordon, V.C.) reached a point 290 paces from the nearest Boer trench, when he was wounded. He was assisted in the first instance by Lieutenant H. E. M. Douglas, who came across a considerable distance from the right, and was awarded the Victoria Cross for this and other acts of gallantry on the same day.

Towse assisted him down to the clump of trees, and a stretcher conveyed him to the field hospitals.

We gave what aid we could to wounded on our extreme right —Seaforths—but owing to the fire there we had to lie perfectly flat.

At first I put the regulation tally on the wounded, but finding this impracticable I threw the book away.

When my dressings were exhausted, I had to return to the Scotch cart for fresh supplies. Proceeding in a direct line, the enemy got one's range and shot close; but going zig-zag, and falling as if wounded, gave a respite from sniping. I do not think the Boers knew I was a medical officer, as the regulation brassard was indistinct at that distance.[1]

The small aid station near the clump of trees proved to be too close—one of the mules was shot in the leg, and a second was killed near by. The Cape Bearer Company did excellent work; this was the only bearer company we were in touch with.

After the general retirement, late in the afternoon, the Gordons took up a position close to Headquarter Hill for the night.

"G" Battery R.H.A.—Lieutenant G. G. Delap, R.A.M.C: On December 11, soon after dawn, about 4 a.m., "G" Battery moved out with the 12th Lancers and Mounted Infantry in the direction of the Highland Brigade, and came up to the eastern extremity of a low stony ridge, afterwards known as Horse Artillery Hill. Just then some stragglers from the Highland Brigade were retiring over it. A few minutes later the battery was in action about 2,000 yards east by south from the south-east corner of the main kopje, with its right flank at the boundary fence separating Cape Colony and the Orange Free State.

The hollow intervening between the Boer positions on the right front and "G" Battery was for the most part covered with scattered clumps of bush, but from the left front of Horse Artillery Hill towards the main kopje the ground was open and bare, except for a few ant-heaps and one or two isolated clumps of bush. It was across this open ground that the Highland Brigade advanced to the attack at dawn, having followed the tracks[2] leading from Modder River Station to Magersfontein Farm

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[1] "A divisional order had been published (*vide* page 297), directing officers to be dressed like the men, and on this occasion Captain Probyn was attired in a kilt, &c., of the regiment to which he was attached.

[2] Not shown on the map.

(Bisset's) as far as Horse Artillery Hill, where it turned direct towards the south-east corner of the main kopje.

When taken by surprise and thrown into confusion by the heavy fire poured into it at close range, the men scattered all over the open space south, south-east and east of the main kopje; some lay down in the open behind ant-heaps, a few pushed on and actually turned the eastern flank of the kopje and got behind the Boer trenches; a large number made for the bush further to the east in the hollow between Horse Artillery Hill and the Boer positions on the crest of the rise north-east of it. A few fell back behind Artillery Hill, where they eventually reformed, and helped to line that position. Of those who lay down in the open few returned unwounded, and it was there that most of the fatalities occurred, as thus exposed and in full view from the main kopje they were constantly sniped. Those who reached the bush were more fortunate, though not in a position to use their rifles without the risk of shooting comrades lying further out. Many lay out there all day without firing a shot and only retired towards evening or during the afternoon, when an attempt was made by the Boers to turn the right flank of Horse Artillery Hill; this was partially successful in that it caused a retirement of our right, in which the Highlanders again suffered severely.

Comparatively few casualties occurred on Horse Artillery Hill, considering its exposed position, but there were many wounded requiring attention at certain points in the bush in front of it. Owing to the formation of the ground and the fact that the front and crest of Horse Artillery Hill were fully exposed to the enemy's rifle fire at 2,000 yards, and less, it was inadvisable to take out full stretcher squads, as they were too conspicuous and readily drew fire; however, at times when the fire slackened, it was feasible to convey a casualty to the rear of the ridge with two bearers to a stretcher, and possibly a third somewhere within hail as a relief, or for one bearer to help a slightly wounded case along. It was necessary at all times to take advantage of every available bit of cover, such as bush or even grass. The moment any one moved out in the open sniping commenced, but immediately ceased or became so erratic as to be harmless on dropping out of sight. The brassard and "S.B." arm bands were, in all probability, one of the first things to catch the eye of Boer snipers, and certainly at 500 to 1,000 yards they must have been frequently seen as something white moving amongst the bushes. Of course the red cross would be invisible at that distance—not that the enemy

showed much respect for it when they saw it; on one occasion immediately after parleying with some members of the Boer ambulance corps (about 600 to 800 yards from the Boer trenches) they warned me that their people would fire on anyone so far out, no matter how occupied, and before they had withdrawn more than a few yards sniping recommenced from the bush close at hand, which they had just left, necessitating a rapid and undignified retreat on my part for the nearest scrub, while they departed at their leisure unmolested across the open.

During the forenoon it was possible to render first aid to a number of casualties out in the bush in front of Horse Artillery Hill. Some were moved into better cover and given a small supply of water when possible. Water was, unfortunately, almost impossible to obtain, or only in very small quantities. "G" Battery water-cart was eventually filled late in the afternoon at the Modder River, 3½ miles in rear, and brought up to the position. But the water was urgently needed for the troops lining the ridge, who had been lying out under a blistering sun all day, and who were relatively worse off than some of the slighter casualties, who had found a certain amount of shade and cover behind bush; moreover, it would have been quite impossible to distribute water amongst the casualties scattered over so wide and exposed an area till after dark.

There was little to be done with stretcher squads or ambulance wagons in front of Horse Artillery Hill, for, though it was quite possible for single individuals to move from place to place without drawing much in the way of fire, a stretcher squad or ambulance wagon made too good a target. On one occasion an ambulance wagon was taken out about 500 yards from Horse Artillery Hill along the track leading to Magersfontein Farm (Bissett's), in order to remove five severely wounded cases grouped in an exposed position by a clump of bush west of the track. It came in for little attention on the outward journey, but while loading up and on the way back was heavily fired on, but made the journey without adding to the list of casualties. It was, however, an experiment not to be repeated. A number of casualties from the Scandinavian Corps, which lay some 500 to 800 yards to the left front of "G" Battery, were brought in from time to time as opportunity offered; some were able to walk with assistance, and several were removed on a wounded Boer pony, found loose near by with a saddle on its back. Although this pony had five severe bullet wounds it made several journeys to and fro until it became too exhausted; it was then

turned loose and immediately commenced to feed. The Scandinavian casualties were mostly in two or three large groups where attempts to stand had been made, but others were scattered through the bush to the northward on their line of retreat, which had been stopped by parties of Highlanders scattered through the bush far out. The Boer "pom-pom" was put out of action by the right section guns of "G" Battery. The team was left where it fell, 100 yards or so in front of the Boer positions. The dismounted gun was apparently removed in what seemed to be a Boer ambulance wagon, which visited the spot shortly afterwards. One visit to this part of the battlefield while fighting was in progress was sufficient to show that there was little to be done in the way of first aid so near the enemy's lines, as many of the casualties found were dead, some, unfortunately, killed by our own shell fire. It is not advisable that medical officers should, as a rule, undertake such duties, but in the circumstances it was justifiable, as the action was prolonged, and from the nature of the ground the risk to single individuals moving from place to place was more apparent than real; moreover, there was little prospect of the bearer companies being able to render assistance or remove the casualties within reasonable time. Experiences during the engagement showed:—

(1) The possibility of rendering a certain amount of "first aid" in front of the firing line by single individuals, given sufficient cover at intervals to render one invisible to the enemy.

(2) The inadvisability and risk of working in groups, e.g., stretcher-squads, or of taking an ambulance wagon, horse, &c., into exposed or conspicuous positions, particularly near the firing line, as it tends to disclose the exact position of the firing line to the enemy as well as to draw fire.

(3) Brassards and arm-bands, or anything conspicuous about the person, are a source of danger when moving about in bush, as they are likely to catch the eye of the enemy's marksmen.

(4) Wounded lying in the open, except cases of extreme urgency, should not be attended to or brought in by medical personnel till firing slackens or ceases, except when there is cover close at hand to place the patient behind until he can be removed later.

(5) The extreme value of cover, however slight, and the advisability of selecting for the purpose inconspicuous objects on the landscape, e.g., small bushes or low scrub in preference to large bushes or trees.

12th Lancers.—Major T. J. O'Donnell, R.A.M.C.: On our first

move forward from Horse Artillery Hill we found a number of Highlanders—they were lying flat, and it was impossible to take medical assistance to them as any movement drew fire. The dismounted squadron of the 12th Lancers and the mounted infantry, in fairly thick bush about half a mile north-east of "G" Battery, had several casualties—though near the enemy, they could not see them or be seen. A few ambulance wagons and stretcher squads from the Guards Brigade Bearer Company were in rear of Horse Artillery Hill. Some of these were called up and utilized. It was impossible to get anything near the Highlanders in our own vicinity, while it was easy enough, owing to the formation of the ground, to get a wagon quite close to the dismounted lancers and mounted infantry who were nearer to the enemy.

9th Lancers.—Captain J. V. Forrest, R.A.M.C.: Most of the casualties occurred in the early morning of December 11. Nearly all were attended to, except one man who was reported missing and who was found next day with a broken arm pinned to the ground by his dead horse. "C" squadron was sent forward to reconnoitre a part of the ground, about a mile south-east of the kopje, and got badly peppered. Most of the cases were able to ride[1] to the dressing station, including a man who lost the greater part of his heel. Later on in the day the greater part of the regiment fought dismounted, but incurred few casualties. Toward evening we were ordered to form up and picket the horses. They had just started to do so when the first Boer shell of the day burst over us and did damage to the four corners of the squadron. One splinter cut a strap on an officer's bridle and the bit fell from the horse's mouth. At another corner one man was hit in the neck by a shrapnel bullet. We moved away from the spot.

R.F.A.—Major H. L. Battersby, R.A.M.C.: The batteries were together during the day. Wounded, including men of other Corps, were dressed at the position, and, if able, they walked to where the ambulance wagons were drawn up in rear. Some were carried on stretchers by the bearers of the Cape Medical Staff Corps Bearer Company attached to the Highland Brigade. I noticed one or more squads of that company marching along the firing line with folded stretchers searching for wounded. At dark the batteries moved to a new position; there was a great demand for water for

[1] Captain Forrest notes that on many occasions during the war wounded Cavalry soldiers, who could not have walked, were able to ride a few miles before their wounds "*stiffened.*" Such cases should be started on horseback as soon as possible after being hit.

men and horses. The mules of my Scotch cart were dispatched before dark to be watered and they did not return. Assisted by the Adjutant, who held a lighted candle to enable me to see, I dressed several wounded of all corps, who came in to where the batteries were after dark. I used the first field dressing, as unfortunately my invaluable Scotch cart with the equipment was away somewhere, and to look for it in the darkness was out of the question, but we continued doing what we could for the wounded. What they required most were warm blankets and beef tea, and brandy, &c. Messages came at intervals saying that officers and men were lying wounded in different places. We sent men after them, but except in one or two instances they never returned that night, having been hopelessly lost in the darkness.

3rd Grenadier Guards.—Captain C. W. Profeit, R.A.M.C.: In this fight the battalion was in reserve, only two companies being in the firing line. One man was killed and a few wounded. A disadvantage of concentrating the stretcher-bearers in such circumstances was well brought out. In the afternoon a squad was wanted, so I took one up to where the casualty occurred, but had difficulty in reaching the place, which was very exposed; the men holding it had been greatly worried by a Boer marksman who fired on the slightest movement and but for the cover from fair-sized boulders there would have been many casualties. After this battle the stretcher-bearers marched with their own companies and were always on the spot if required. This prevented a good deal of misunderstanding and kept the bearers well up in the firing line, as, after all, carrying a rifle and getting a chance of a shot is a very different thing to carrying a stretcher and being a good mark for other people with no chance to retaliate.

1st Coldstream Guards.—Captain A. W. Hooper: Soon after dawn the battalion was in action. The regimental stretcher-bearers were grouped in rear and carried back the first casualties, they did not return near the front line again as the ground was exposed to fire, which made movement difficult—but not impossible. Wounded remained in positions affording cover, as far as possible, during the day until removed by the Bearer Company to the field hospitals or until opportunity enabled them to walk there. After dark Captain Hooper obtained an ambulance wagon from the Guards Brigade Bearer Company and took it to the ground where the battalion had been in action, but, it was very dark and the ground was so broken that movement was difficult. No casualties were picked up, and shouting failed to get any reply, so the ambulance wagon was brought back to the site of the Guards Field Hospital.

The 2nd Coldstream Guards' casualties were dealt with similarly to those of the 12th Lancers and Horse Artillery.

Field Medical Units.

By 4 a.m. the medical units were situated thus :—

In the vicinity of Headquarter Hill: Guards Brigade Bearer Company, Guards Brigade Field Hospital, Highland Brigade Bearer Company, Highland Brigade Field Hospital, Divisional Troops Field Hospital.

At Modder River Camp: 9th Brigade Bearer Company (less a detachment under Lieutenant Fell at the Ganger's Hut), 9th Brigade Field Hospital.

The units which accompanied No. 3 column from Modder at 12.30 a.m. had a difficult march owing to the extreme darkness, and the Guards Brigade Bearer Company at one time completely lost touch.

Soon after daybreak the Highland Brigade Bearer Company moved forward and opened a dressing station—about 5 a.m.—at Headquarter Hill, about 1,000 yards in advance of the site of the bivouac, and sent forward ambulance wagons and stretcher squads in the direction from which wounded men began to fall back from the Highland Brigade.

The officer commanding Guards Brigade Bearer Company was not aware of the position of the troops, but after the Brigade had advanced from Headquarter Hill he heard firing on the right front and moved in that direction.

"After going a little more than a mile through scrub, in which we could not get a good view, we came under fire and fell back a short way to a point that appeared to be safe, close to a dry pan. We halted there and did not move again till the next day. We at once opened a dressing station (marked on map about 1,200 yards east of Headquarter Hill) as wounded were already walking back from firing line. This was about 5.15 a.m. Stretcher squads under Captain T. B. Beach went out eastwards and towards Horse Artillery Hill. Ambulance wagons went forward when and where possible, but their movements were altogether governed by enemy's fire and the ground. By 6.30 a.m. a number of wounded had been collected. Few of them could have walked to Modder River, if wounded sufficiently to be allowed to go back at all."[1]

[1] Extract from a report made by Major H. J. R. Moberly in command of Guards Brigade Bearer Company.

The Highland Brigade Field Hospital was ordered to halt with its wagons parked about half a mile south of Headquarter Hill (see rear field hospital, marked on Map); this unit took no part in the work of taking in wounded during the forenoon. The Guards Brigade Field Hospital and the Divisional Field Hospital halted in advance of the Highland Brigade Field Hospital, nearer to Headquarter Hill.

At 7 a.m., as the wounded were coming in very rapidly, the Highland Brigade Bearer Company and the Guards Bearer Company were ordered by Colonel Townsend, P.M.O., to send fully loaded ambulance wagons to Modder River. At 7.50 these ambulance wagons started with 50 wounded

At 8 p.m. the Guards Field Hospital personnel was ordered up to help the Guards Bearer Company, and the Divisional Field Hospital was ordered to help the Highland Brigade Bearer Company. The majority of the personnel of the Divisional Field Hospital were used as stretcher-bearers during the morning and early afternoon. It was not known at the time whether the 9th Brigade had been engaged, so a message was sent to Major F. A. Harris, S.M.O., of that brigade, asking him to send out some ambulance wagons of the 9th Brigade Bearer Company if they could be spared. On receipt of this request Lieutenant Fell, R.A.M.C., was called in form the Ganger's Hut and sent out towards Headquarter Hill with about three stretcher squads of the 9th Brigade Bearer Company and nearly a dozen wagons of sorts. He reported himself to Colonel Hartley in command of the Dressing Station at Headquarter Hill, and was ordered to go forward and start a collecting station. This was opened a little later at a point near the road from Modder River to Magersfontein Farm 1,000 yards east of the 65th (Howitzer) Battery, R.F.A. (see Map). Large numbers of unwounded men in addition to wounded collected here and impeded the work. Ambulance wagons came up continually and were filled and sent back to Colonel Hartley at the Dressing Station at Headquarter Hill.

At 10 a.m. the firing had slackened very much. The ambulance wagons sent in at 7.50 a.m. began to arrive back from Modder.

By 1 p.m. the Guards Bearer Company had sent in to Modder River 130, and the Highland Brigade Bearer Company 130—total 260. Most of the ambulance wagon mules had by now done two journeys to Modder River and covered more than 20 miles, not including, in the case of the Guards Bearer Company, the night march out from Modder River. They required rest and had to be fed and watered at Voetpad's Drift, two miles south of Headquarter Hill. This delayed the evacuation.

At 2.30 p.m. the whole front was fairly clear of fire, and as the number of wounded not yet brought in was evidently large it was decided to stop sending the ambulance wagons to Modder River and use them all in front to convey wounded to the dressing stations.

At 3 p.m., the Guards Field Hospital was ordered to move its equipment up to the site of the Guards Bearer Company Dressing Station and open there. The Divisional Field Hospital received a similar order shortly afterwards. The position was a convenient one, situated as it was at the western edge of some thick scrub and trees about one mile east of Headquarter Hill, 2¼ miles south of Magersfontein Hill, 2 miles north of the river, 1¼ miles west of the advance line of the 1st Coldstream Guards and about 5½ miles (by nearest tracks) from Modder River Station. Owing to the stony nature of the ground it was impossible to pitch tents at points other than in the immediate vicinity of the dry pan where the Guards Bearer Company established its Dressing Station.

At 4 p.m. Colonel Townsend decided to again commence evacuation to Modder River, and some empty supply wagons in charge of an officer, which the Serjeant-Major of the Guards Brigade Bearer Company picked up on the veldt, were loaded and sent in. However, soon afterwards it was apparent that all the medical units would be required to deal with the wounded still out on the field. There were many to be dressed and fed, and at 4.30 p.m. the Highland Brigade Field Hospital, which up to then had been kept completely in reserve, was ordered to pitch alongside the Guards Field Hospital. In a very short time its tents were filled, and indeed wounded kept dropping in all through the night. A little later the Highland Brigade Bearer Company was ordered to move the wounded from the Dressing Station at Headquarter Hill to the same site, as it was thought desirable to concentrate all the wounded and medical units at the same place for the night and thus get as many as possible under cover.

The combined units acted as an enlarged dressing station. The wounded were given beef tea, milk and in some cases the rations carried for the personnel of the medical units. Wounded at the Guards Bearer Company Dressing Station were retained there after Field Hospitals opened beside it. The Guards Brigade Field Hospital,[1] acting as a dressing station, dealt with a very large number.

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[1] The Guards Brigade Field Hospital had carried a supply of boiled water, from Modder River, for surgical purposes.

The two officers of the German Army Medical Service attached to that unit were untiring in rendering valuable assistance to the wounded throughout the day and night.

Lieutenant Fell, 9th Brigade Bearer Company, returned to his unit at Modder River with the stretcher squads about 6 p.m.; the ambulance wagons he brought out had already gone in with wounded.

About 9 p.m. Lord Methuen told the P.M.O. confidentially that the whole force would probably have to fall back.

Colonel Townsend thereupon decided, with the G.O.C.'s concurrence, to begin immediately to despatch the wounded to Modder River.

The field hospitals (Guards, Highland, and Divisional), and the Guards and Highland Brigade bearer companies, were at once directed to get ready: a mounted messenger[1] was sent to warn Major Harris, 9th Brigade F.H., S.M.O., at Modder River to prepare to receive convoys during the night.

By 9.30 p.m. the ambulance wagons were being loaded with the more serious cases.

At 10 p.m., the first convoy of ambulance wagons started and at 12 midnight the remaining wagons got away.

December 12.—The Guards Brigade and Divisional Field Hospitals were then ordered to get ready five of their transport wagons (buck wagons), and load them up with slightly wounded. They started at 1 a.m., just as the moon set. Surgeon-Major Beevor, who was in charge of these wagons, had great difficulty in guiding them owing to the intense darkness.

At 4 a.m., the ambulance wagons began to arrive from Modder River and were loaded and sent back as soon as possible.

About 6 a.m., before it was finally decided whether the troops should retain the ground gained or retire on Modder River, a messenger bearing a flag of truce from the enemy arrived at the outposts of the Scots Guards. He reported that there was a large number of dead near the point of Magersfontein Hill and asked for medical assistance to be sent to some British wounded lying near the trenches.

Arrangements were at once made to send out medical officers and ambulance wagons, and a party of Royal Engineers to bury the dead. I was sent out in advance to inform the enemy what was being done. The commandant of the trenches at the south-eastern point of Magersfontein Hill agreed to allow the ambulance party to collect the wounded. He said he could not permit a burial

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[1] Mr. De Witte, a local guide, supplied to Colonel Townsend.

party to approach his lines, but that the British General might, if he wished, send out wagons with Kaffir drivers to remove the dead. I reported this to Lord Methuen at Headquarter Hill, and when returning again to the Boer lines with the ambulance wagons one of the enemy's guns opened fire on the Field Artillery position extending across the road along which the ambulance wagons passed. The Boer commandant on being told that our artillery would not reply to his fire so long as the ambulance party was within his lines, said that his gun was only brought into action as a protest against the action of the Naval 4·7-inch gun (the Naval gunners were not aware of the situation) which had just then fired a few shells at the western end of the trenches. He agreed to stop his gun if instructions were sent to the Naval gun to cease fire. This was done, and both sides stood fast while the wounded were being removed. The ambulance party sent to the Boer lines was furnished by the Guards Brigade Bearer Company and consisted of six ambulance wagons, with a supply of medical comforts, dressings, &c., and about twenty N.C.O.s and men under command of Captain T. B. Beach, who was accompanied by Civil Surgeon Croghan.

The wounded to be removed, including Lieutenant Wauchope of the Black Watch, numbered thirty-eight. Some of them were only about 100 yards from the trenches at the foot of the kopje, and nearly all were well round to the eastern side of it; they had been hit early the previous morning, probably between 4 and 5 a.m. When the ambulance wagons arrived they had been lying where they fell for about twenty-six hours, having been exposed to a scorching sun followed by a bitterly cold night, and their position was directly in the line of fire aimed at the point of the kopje throughout the whole day on the 11th.

All of them were very badly wounded, the majority suffering from fractured legs, amongst which were a number of severely fractured thighs. Captain Beach put up one of these with a rifle splint, but the Boer commandant objected to any rifles being taken away even as splints. The trenches were fully manned with Boers while the work of loading the ambulance wagons was going on. General Wauchope's body was found and sent in to Modder in a wagon after the wounded had been removed. The ambulance party rejoined its unit at Modder River after the retirement.[1]

[1] When the last ambulance wagons were starting for our lines I was with a party of Boers about a mile east of Magersfontein Hill where two wounded Highlanders had been found in the Bush. One of the Boers who was interested in the saddlery on my horse, which I had given to a Boer boy to hold, came to the

Up to 7 a.m. when the ambulance wagons were sent to the Boer lines it seemed likely that the field hospitals would be cleared in the course of a few hours, but this unexpected detachment seriously interfered with the work of evacuation.

At 7.30 a.m. some ambulance wagons returned to the field hospitals from Modder River, and when they were loaded and despatched the Guards Brigade and Divisional Field Hospitals were clear of wounded. They packed up and prepared to move.

A retirement of the whole force on Modder River had been meanwhile definitely decided upon. There were still fifty wounded with the Highland Brigade Field Hospital and no more ambulance wagons available, so at 9 a.m. Colonel Townsend decided to obtain a party of regimental men to convey these cases by hand. This party, which was furnished by the Highland Brigade, arrived at the field hospital site at 11 a.m. and they were at once started off carrying the wounded. The last of these bearers was off the ground by 12 noon, at which hour the advanced troops began to fall back on Modder River. Major W. H. Murray, in command of the Highland Brigade Field Hospital, thus described the removal of the last wounded: "Six men were told off to each stretcher, four carrying it while two acted as reliefs. As each hospital tent was emptied it was packed in the transport wagons, so that by the time the last tent was struck the hospital moved off. Ours was the last medical unit to leave the field, and during the time the stretchers were being loaded many shells from a Boer gun fell unpleasantly near, being, I think, aimed not at the hospital, but at some cavalry who would retire through the hospital camp. It was a long and weary tramp back to Modder River Camp, progress being necessarily slow, as the stretcher parties had to halt frequently and relieve one another. During the retirement the Boers sent several farewell shells after the squads, happily without any untoward result, though some of them fell disagreeably near."[1]

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conclusion that my revolver (unloaded), in a wallet on my saddle, constituted a breach of the Geneva Convention. He asked me to come with him to the Commandant some distance in rear. The latter seemed annoyed that I had been detained, but said I had seen too much of their position to be allowed to return. I was sent to Jacobsdaal in the afternoon. After five days in the local jail I was blindfolded, mounted on my horse, and led by two despatch riders to a point some miles east of Honeynest kloof, where I was released, and made my way back to Modder River camp.—C. H. B.

[1] When out of range the bearers lagged a good deal and Surgeon Lieutenant-Colonel Magill and Major W. H. Murray themselves helped to carry the final stretchers.

During the retirement the rearguard was composed of the Cavalry, M.I., and G Battery, R.H.A., with some infantry. One man of G Battery, who received a serious shell wound, had to be carried by hand for about a mile, then the rearmost of the retiring ambulance wagons was overtaken, but only to find that there was no room for a lying-down case. The difficulty was overcome by unfastening the wagon tilt on either side, placing the stretcher transversely between the bales[1] with the ends projecting on either side and fixing it. The patient was secured to the stretcher by bandages hitched round his shoulders and ankles, and fastened to the handles of the stretcher.

The closing event of the action was a salvo of lyddite from the Howitzer Battery directed on Magersfontein Hill.

By 2 p.m. all the wounded had arrived at Modder River, and at 4 p.m. the rearguard was in camp.

Events at Modder During the Action.

When the troops marched out on December 10, the 9th Brigade Field Hospital took over all the sick—about 200—in the other field hospitals. These had not been disposed of when orders were received early on the 11th to prepare for the reception of a large number of wounded.

As the field hospital had already been encamped for a few days it was practically ready to meet the strain. Food and medical comforts were prepared, the operating tent pitched, and staff told off. As time passed wounded arrived, and it became necessary to make further preparation. When all the hospital tents had been pitched the neighbouring tents belonging to an infantry battalion, which had been left standing, were utilized; consequently it was possible to provide tent accommodation for the whole of the wounded. Some bales of blankets were found and made use of.

The first wounded arrived about 9 a.m. on the 11th; they came in slowly at first, but during the night of 11th-12th the arrival of ambulance and other wagons was incessant, and continued until the

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[1] This is not desirable for general use, but in cases of emergency it might be possible to so carry five, or possibly six, lying-down cases. The objection to placing stretchers transversely is probably overrated. Projecting handles may be fouled by passing vehicles on narrow country roads, but this is an unlikely accident on open tracks; they do not project much further than the side rails of a G.S. wagon.—G. G. Delap.

afternoon of the 12th. Over 600 were received altogether,[1] and all had to be fed, dressed and prepared for evacuation by rail.

There was no shortage of medical and surgical stores, as a reserve had been laid in by the hospital, and extra supplies had been wired for when troops moved out. The Supply Column was able to furnish all the requirements in the way of food and medical comforts.[2]

Numbers of the wounded on arrival at Modder River had been many hours without food, some were in a state of exhaustion and even if fit to rejoin their units they had to be fed by the field hospital. For the majority ration biscuits and corned beef alone were useless, and they had to be given beef tea, milk, arrowroot,[3] &c. A reserve of these articles, which had been laid in by the field hospital, enabled sudden demands to be met and allowed time to obtain fresh supplies. As at Graspan, iron rails and coal from the railway were used in the kitchen, which had to be enlarged. Additional camp kettles were obtained from various sources. The ordinary pannikins without handles proved very inconvenient for giving hot liquids.[4]

At first the disposal of dead was arranged for by the Field Hospital Quartermaster, who was directed by an officer Headquarters Staff to select a site for burial. On return of the troops this work was done regimentally. All funerals here were conducted by a chaplain.

In compliance with telegrams despatched to the Line of Communication, before the action, two ambulance trains—No. 2, Captain C. Fleming, R.A.M.C., and No. 3, Captain M. W. Russell, R.A.M.C. —arrived at Modder[5] River at midnight on December 11-12.

No. 2 train was loaded up during the early hours of the 12th

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[1] The total wounded admitted to field hospitals numbered 685. On return to Modder River the Highland Brigade Field Hospital took in the last wounded that came in from the field, i.e., about 80 odd.

[2] A remonstrance arrived from someone in Cape Town that the three months' scale for the whole Division had been exceeded.

[3] After Magersfontein the hospital always had a supply of oatmeal and tinned fowl.

[4] Later enamelled mugs with handles were obtained from the Army Ordnance Department. These could be strung together and carried in sacks.

[5] The low-level deviation railway bridge (alongside the permanent bridge, in part destroyed by the enemy) was completed, and was in use from December 7, so these trains came up to the railway station platform, adjoining which was the site of the 9th Brigade Field Hospital.

with 130 wounded[1]—26 officers, 104 other ranks—and started at daybreak for Orange River. This train was blocked on the south side of the river, and did not get clear away till 9 a.m.

No. 3 train left a little later for Orange River with 141, including one officer, returned to Modder River, and left again in the evening for Cape Town, with 96 wounded, 36 of whom were dropped at Orange River *en route.*

No. 2 train also arrived back at Modder River at 6 p.m., and loaded up 104 less seriously wounded, with which it started for De Aar (70 miles south of Orange River) at daybreak on December 13.

Thus 471 of the 680 odd wounded had been despatched by rail or loaded ready to start by midnight on December 12-13.

On the 13th No. 2 ambulance train arrived at Modder River from De Aar at 11 p.m. and left on the 14th at 11 a.m. with 137 wounded, dropped 46 at Orange River, and went on to the Cape with the remaining 91.

At 2.30 p.m. the same day a train made up of ordinary passenger coaches left for Orange River with 24 wounded and 127 sick—total 151.

On the departure of this train—forty-eight hours after the return of the troops from the action—only ten wounded remained at Modder River out of the 685 admitted to the field hospitals, i.e., six cases of very serious fractures, and two very slight cases remained in the Highland Brigade Field Hospital, and two serious —operation—cases in the 9th Brigade Field Hospital.

(*To be continued.*)

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[1] Two men died *en route* to Orange River.

Clinical and other Notes.

A FOURTH REPORT ON SPINAL ANALGESIA.

By Major J. W. H. Houghton.
Royal Army Medical Corps.

The following cases constitute the fourth series operated on by me under spinal analgesia, and are the second hundred consecutive cases in which spinal analgesia has been used in the Cambridge Hospital, Aldershot. In conformity with the three reports previously published in this Journal (see vol. xi, p. 117; vol. xiii, p. 384; vol. xvii, p. 169) the cases are taken consecutively without omissions and the results are such as to confirm my former appreciation of, and confidence in this method. That spinal analgesia is a great help to the operator, especially when short handed, is now freely admitted, and that its safety is such as to make its employment preferable to the use of chloroform is also fully established.

The principles and technique which are involved in this method of anæsthesia should, however, be thoroughly studied before any attempt is made to employ it. They are simpler to master than the administration of general anæsthesia.

This last series of 100 cases was operated on for the following conditions:—

Hernia, 31; acute appendicitis, 8; appendicectomy *à froid*, 11; gastro-enterostomy, 2; other laparotomies, 2; ovariotomy, 1; total abdominal operations, 55.

Hæmorrhoids and fistulæ, 11; diseases of the pubis and genitals, 17; fractures and wiring, 8; displacements of the internal semi-lunar cartilage and affections of the knee-joint, 4; lumbar abscess, 1; empyema, 1; stretching sciatic nerve, 1; varicose veins in leg, 2; total, 45.

Total operations, 100.

There was no case of failure in entering the dural sac, and in no case did the injected fluid fail to act.

In four cases the analgesia did not last to the completion of the operation, so in these cases the final stitches were inserted painlessly under the influence of light chloroform anæsthesia. During the operation there was faintness or nausea in twenty cases. This usually lasted about ten minutes, when it passed off and left the patient comfortable.

In thirteen cases the patients vomited on returning to the ward.

Twenty-five patients complained of headache on the evening following the operation, but in only three of these cases was it necessary to administer a sleeping draught.

A SHORT NOTE ON BLOOD CULTURE.

By Major C. E. P. FOWLER.
Royal Army Medical Corps.

The following brief account of a series of one hundred cases, in which cultures were made from the blood, may be of interest. In any event it will add a little more to the value already attached to the prompt withdrawal and culture of the blood in all doubtful fevers, more especially in those countries where enteric and other fevers have to be differentiated. First a word as to technique. In every instance from 5 to 15 c.c. of blood were abstracted. There should not be the least difficulty in obtaining this amount of blood, provided that the veins can be made to stand out, which is almost essential; with children, delicate women, or exceedingly stout subjects, some difficulty may be met with.

Ordinary lemco broth and pure ox-bile were the primary media employed. As a routine procedure two flasks of 100 c.c. of broth, and two small flasks of 50 c.c. of ox-bile were used for the blood of each case, the blood being equally divided amongst the four flasks. Four or five flasks were always used, as it has so often been shown that one or two flasks may prove to be contaminated, or that the typhoid organism is only found in one flask, the others turning out to be sterile. To prevent contaminations, it is most essential that the air around the bed, whilst the blood is being drawn off, should be still. This may not be thought of, but in a hot and dusty climate it is important. In the presence of any contaminating air-microbes the typhoid organism will not thrive. The former grow and mask the few typhoid bacilli that possibly may be in the blood.

The flasks are shaken and put in the incubator, which is kept at body temperature. At the end of twenty-four hours there may be a chance of finding the *Bacillus typhosus*, but not such organisms as the slow-growing *Micrococcus melitensis.*

To find the *B. typhosus* at the expiration of this period, it is necessary to take out from the culture medium more than the ordinary platinum loopful. The bacilli may be so few in number that this small amount will not contain them. It has, therefore, been usual to employ a glass rod and to take out as much of the broth or bile as will adhere to the rod. This represents a large drop or more. If a trial is not made until the lapse of forty-eight hours, then the usual platinum loopful suffices, as by this time the bacilli will have multiplied and can readily be found. There is a wide choice of media on which the primary culture can be placed, but from every point of view, the simpler the medium used the better. For blood work, the ordinary litmus lactose agar plate answers all purposes. Nutrose can be added, if there is any likelihood of finding the *M. melitensis.*

This medium has the great advantage of being very easily made, which cannot be said of certain others of the special media. The latter are of

course more efficient when one is seeking to isolate the typhoid organism from stools and so on.

Two of the lactose plates are used for smearing the contents of one drop or loopful of the culture medium.

After twenty-four hours' incubation at 37° C. the typhoid colonies will stand out plainly, should any be present. These are then fished and the organism tested with an antityphoid serum, and put through the different media in the routine manner.

One or two points are worthy of notice when trying to isolate the *B. typhosus*. One is that the bacillus is seldom motile, when first fished off the lactose plate; another is that the delicacy of agglutination is small compared with subsequent sub-cultures. Both these points have been previously noted, but one might at first be led astray by finding an organism which was quite immobile, and think that it was not typhoid. Nevertheless, in nearly every first culture off a lactose plate there is practically no motility. On the other hand we must not be deceived by finding a highly active organism which may grow for the first thirty hours on the plate like *B. typhosus*, and which may also show some agglutinative response to a serum. When hurried for a diagnosis by the clinician, one might venture to say that the *B. typhosus* had been isolated, only to find next day that the culture was not that bacillus but the *B. pyocyaneus* or some other organism. This has happened to the writer on more than one occasion.

Of the 100 cases all were suffering from fever and indefinite symptoms when the blood was drawn.

The subsequent history of 21 of these patients showed that the disease from which they suffered was not typhoid, and therefore the *B. typhosus* was not found in their blood. From 1 the *M. melitensis* was recovered. Five others proved to be pneumonia, 1 typhus fever, 2 tubercle, and the remainder very transient fever of indefinite origin.

Thus there were left 79 cases. In 67 of these the *B. typhosus* was recovered, in 2 cases the *B. paratyphosus* B. In 1 case both *B. typhosus* and *M. melitensis* appeared together. The remaining 10 gave negative results, i.e., the culture proved sterile, or was contaminated. The clinical history of these 10 cases was that of a mild attack of enteric fever. It may, therefore, be stated that the *B. typhosus*, or *B. paratyphosus*, was recovered out of the blood drawn from patients suffering from what was, or appeared to be, typhoid fever, in 88 per cent. of the cases. In only two really typical attacks did failure result. The other 8 cases were all very mild in character, with temperatures seldom above 102° F. and with fever lasting only about seventeen or eighteen days.

There is little doubt but that the more severe the attack and the higher the fever, the more typhoid organisms there are in the blood, and therefore the greater the chance of obtaining them by culture. Also the earlier the blood is taken the better from every point of view. Not only

is the value of a definite diagnosis much greater, but the opportunity of isolating the bacilli is also more favourable.

One other interesting point was the working out of the comparison between the Widal reaction and the finding of the organism in the blood. This was carried out in 44 of the cases. The result was as follows: On 42 occasions the *B. typhosus* was isolated. In only 13 of these cases was the Widal reaction positive, that is, a reaction was given at 1 in 40, or a higher dilution.

In the two cases from which the organism could not be isolated, a Widal reaction was obtained. This can be explained by the fact that it was late in the disease when the blood was abstracted, which is all in favour of a positive result of the Widal test, but against the finding of the organism.

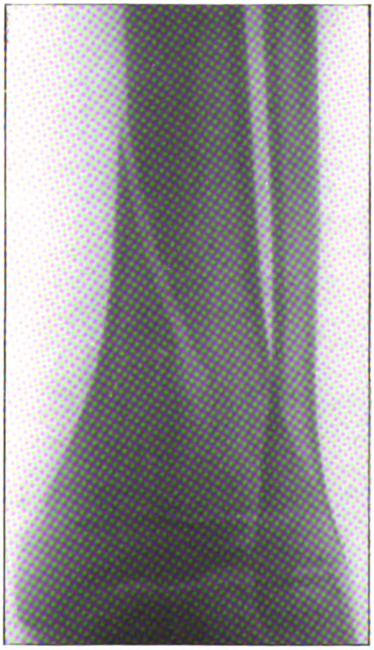
The majority of the cases were patients in the Military Hospital, Gibraltar, and the blood was taken by Captains Priestley and Spencer. Both these officers were keenly interested in the work and have done everything in their power to supply specimens in the best condition and at the earliest possible stage of the disease. It is only by the clinician and bacteriologist thus working together that the best results of any such inquiry can be hoped for.

It may be stated without any exaggeration that the benefit conferred on the clinician, as a result of a little trouble on his part, is well repaid by the advantage of being supplied with a definite diagnosis within a few days of a fever patient's admission. Take the example of a patient who has been admitted on the Monday. The blood is drawn at once, incubated till Tuesday, and growth sufficient for plating may be present on this day, so that on Wednesday an almost definite diagnosis can be given, from the appearance of the colony and the agglutination of the bacillus with a prepared serum. By Thursday this can be quite definitely proved. Compared with such a result the Widal reaction gives a poor outlook.

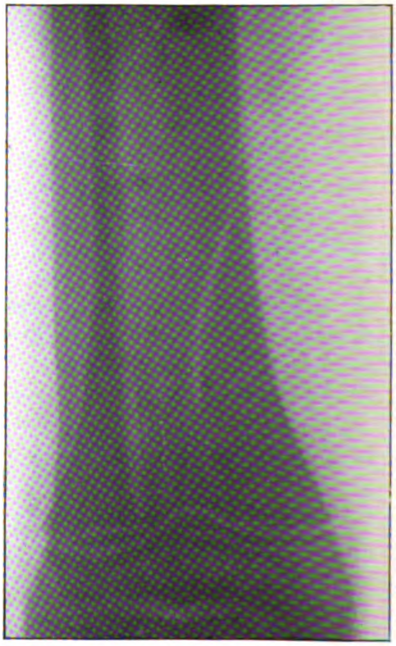
It is freely granted that the agglutinative power of a patient's serum does not develop in most cases of enteric fever until at least one week from the commencement of the illness.

It is quite understood that in private practice any such operation, as the friends of patients may imagine the withdrawal of blood to be, is difficult to arrange; but in the Service, when one is practically master of one's patients, there should be no trouble.

I have to thank Mr. G. A. Abrines, Analyst in the Public Health Laboratories, for his help in carrying out a very large part of this work.



Case 1.



Case 2.

To illustrate "Fractured Tibia without displacement."

By Lieutenant-Colonel J. B. Wilson, R.A.M.C.

FRACTURED TIBIA WITHOUT DISPLACEMENT.

By Lieutenant-Colonel J. B. Wilson.
Royal Army Medical Corps.

The following two cases are reported in continuation of some remarks made in an article on "Two and a Half Years' Surgical Work at the Royal Herbert Hospital, Woolwich," in the Journal of the Royal Army Medical Corps, for January, 1912. They occurred just at the time this article was going to press, and they illustrate the remark which was therein made that the constant use of the X-rays has demonstrated the fact that fracture even of large bones without any displacement is not at all an uncommon occurrence.

No. (1) Boy F., was admitted to the Royal Herbert Hospital, on November 10, 1911, complaining of great pain in the right ankle-joint, which was distended with fluid. There was also some fluid in the sheaths of the tendons round the joint. The boy looked ill, and osteomyelitis was feared. There was, however, no pyrexia.

The history was that in doing a "hand spring or back somersault" from the floor on to the floor, he went too far, and instead of landing with both feet flat on the ground, he landed on the toes of the right foot. He fell on the ground with the weight of the body across the right leg.

It was several days before the idea of fracture presented itself to me in this case, as none of the usual symptoms were present. There was no crepitation or unnatural mobility. The bones were in their normal shape and position and there was nothing to show injury except synovitis of the joint and the tendon sheaths.

Ultimately a tender, and very slightly œdematous spot on the front of the tibia was found. The X-rays were then employed with the result that the tibia was found to be fractured as shown in the plate. There was no displacement.

Recovery was uneventful and complete.

Treatment consisted of massage and rest between sandbags.

No. (2) Boy R., was admitted on November 21, 1911. Like the last boy he belonged to the Ordnance Corps, and also like him he had been trying to do a "hand spring."

The only difference was that this boy did it off a table.

The result, however, was the same in both cases, viz., an oblique fracture of the tibia at the junction of its lower and middle thirds, without displacement and apparently without tearing of the periosteum. This boy also got well without any trouble under treatment by sandbags and massage.

The plate shows the fractured tibia of Case 1, and also that of Case 2.

FRACTURE OF FEMUR (LESSER TROCHANTER).

By Lieutenant-Colonel W. L. GRAY.
Royal Army Medical Corps.

On November 11, 1911, the patient had a severe fall with his bicycle, landing heavily on the left hip with the bicycle on top of him. There was great pain and extensive swelling of the hip and upper part of the thigh and fullness in the groin at the upper part of Scarpa's triangle. On examination neither shortening nor lengthening of the limb was present. Crepitus could not be elicited and the leg and foot were strongly everted, but could be rotated into the normal position. Diagnosis being obscure, an X-ray photo was taken which showed fracture and separation of the lesser trochanter of the femur. The X-ray picture shows the condition; as it is somewhat rare I think it worth recording.

DYSENTERIC ULCERATION, WITHOUT DYSENTERIC SYMPTOMS, FOLLOWED BY HEPATIC ABSCESS.

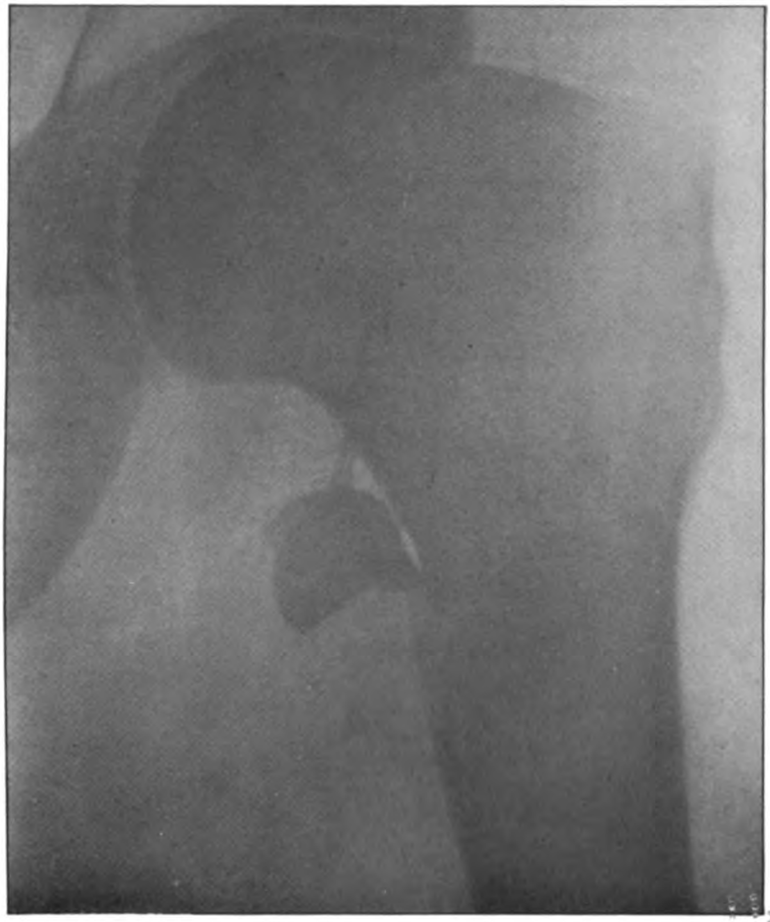
By Captain F. H. BRADLEY and Major F. SMITH, D.S.O.
Royal Army Medical Corps.

The patient on admission to the Station Hospital, Calcutta, complained of pain in the right side and shoulder-blade. His temperature was 101·4, and he looked ill. There was some pain and tenderness over the region of the ascending colon. Pain in the right knee was also mentioned—the knee felt hot but was not swollen. A month and a half earlier the man had been in hospital for malaria, diagnosed on microscopical evidence.

At first appendicitis was thought of, a few days later the signs and symptoms pointed to liver disease—the liver being enlarged and tender. The bowels were regular and the pain in the right knee still marked. Rigidity of the rectus was noted on the right side on palpation.

Seven days after admission the pain in the right knee seemed the most marked symptom—the liver was less tender. Salicylate of soda was administered. Widal's reaction for typhoid and paratyphoid fever proved negative.

On the eighth day after admission clotted blood—about 4 oz.—was passed from the bowels. On the ninth day there was more blood. There were no piles and it was evident that the blood came from the bowel. The condition of the blood suggested ulceration into a vein high up in the colon. Liver abscess was suspected, and the patient was put on ipecacuanha in large doses on the eleventh day. There were three tarry motions on the twelfth day. Ultimately the diagnosis of liver abscess was established, and under treatment the patient recovered, as will be described in a further note on the treatment of abscess of the liver.



To illustrate "Fracture of Femur."
By Lieutenant-Colonel W. L. GRAY, R.A.M.C.

The interest of the case from the medical point of view as distinguished from the surgical lies in the fact that ulceration of the bowel produced none of the bowel indications associated with dysentery producing abscess except hæmorrhage, and hæmorrhage of the character described is not common in dysentery. But for the hæmorrhage, ulceration would not have been noted, and the abscess would probably have been either styled idiopathic or ascribed to malaria.

Remarks.—A good deal of dysentery and so-called colitis have been prevalent in the unit to which this man belonged, and have been very difficult to account for. Possibly they may have been kept going by unrecognized but milder cases of the character of this one. Dysenteric ulcers or inflammation in the neighbourhood of the cæcum might conceivably not cause diarrhœa. We know that enteric ulcers may exist without producing diarrhœa—in a good number of cases indeed constipation is a feature of enteric fever. It may be objected in regard to the title of this note that the ulceration was not dysenteric. The abscess, or abscesses (for there are believed to have been two), were of the kind usually put down to the amœba and supposed to be amenable to ipecacuanha as well as to surgical measures. The amœba in this case was found in the liver pus. Amœbic abscess and amœbic dysentery are commonly held to be alike in causation — the abscess following the dysentery; here, however, the abscess, we imagine, was caused by an amœba, which began its operations in the intestine, but did not give rise to the *bloody* flux which we call "dysentery."

A REGIMENTAL SELF-COOKING EQUIPMENT.

By Captain C. W. BOWLE.
Royal Army Medical Corps.

It is to be feared that we are somewhat behind Continental armies in the use and development of self-cookers and field-cooking apparatus generally. For some time the South Lancashire Regiment in India have been using an equipment of the kind which is a serious attempt to provide at least hot food quickly for troops in the field.

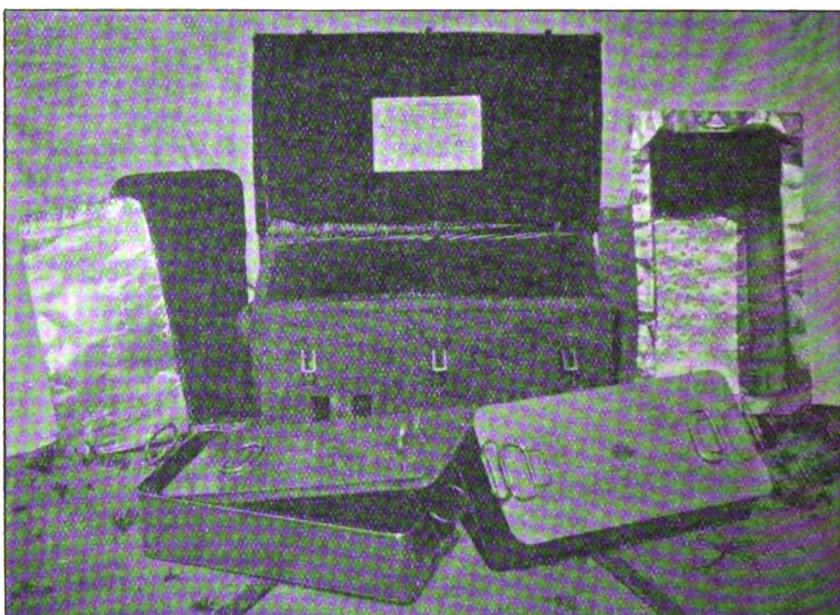
The equipment is in the form of two panniers, and is known as the "Norwegian Self-Acting Cooking Apparatus." Each pannier is made of wicker-basket work, covered with green Willesden canvas. It has leather handles for lifting purposes, and patent fasteners for the lid, with two leather straps with D's for using on pack transport.

Length (outside)	2 ft. 3 in.
Width	1 ,, 4 ,,
Height	1 ,, 5 ,,

Inside the pannier is packed or lined very solidly with two inches of felt, and neatly covered with dark blue Melton cloth. A loose cushion, similarly made and covered, is fitted inside the lid.

There are two dishes, made of block tin, each 20 in. by 10 in., in which the partially-cooked food is placed. These dishes should be warmed before placing the food in them. The temperature of the food remains constant for twenty-four hours or more.

When in medical charge of the regiment last year I had occasion to criticise these panniers unfavourably, owing to the leaking of gravy and fat out of the dishes soiling the cushioned sides of the basket work, which became malodorous and putrescent, and which, when placed in the sun for deodorizing purposes, became covered with flies. This leakage



was caused by the jolting motion of the pack mules during transport. Under my advice and direction, a tin receptacle with cover was made for the two dishes to fit into, so as to come between the leaking lids of the food dishes and the cushioned walls of the panniers. Any fluid leaking out of the dishes into this receptacle can now be easily removed by taking out the tin receptacle, which can then be cleaned and replaced. The D's on the loading straps are hardly strong enough to bear the weight of the panniers when full, consequently, in practice in the field with these panniers ropes have been generally used.

The weight when empty equals 45 lb., and each dish holds twenty mens' rations of 1 lb. each, which is about the weight of his meat and

potatoes after cooking. Two panniers are supplied to each Company, thus, eighty mens' rations are available at any time. These panniers are intended primarily for stews; they are very popular with the men, and are considered to be of excellent service by officers and those who have to use them. The photograph on p. 580 sufficiently illustrates the whole equipment.

Lectures.

NO. 1.—THE MOBILIZATION OF FIELD MEDICAL UNITS.

By Lieutenant-Colonel O. R. A. JULIAN, C.M.G.
Royal Army Medical Corps.

In para. 1, Part 1, Regulations for Mobilization, 1909, the term mobilization is defined as "the process by which an armed force passes from a peace to a war footing. The mobilization, therefore, of a unit means its completion for war in personnel, animals, and *matériel.*"

As regards medical units, however, this definition seems to require some slight amplification, for with the exception of those of the territorial forces, they are non-existent in peace time. Mobilization from our point of view should include the collection and concentration of the component portions of a medical unit in addition to its subsequent completion. This collecting, etc., is carefully thought out and arranged for in peace time, so that when the occasion arises it may be carried out with smoothness and celerity. It is essential that officers should have a clear understanding of the details of the procedure, as in war time emergencies arise necessitating sudden and unforeseen mobilizations. This will be alluded to later.

In para. 2, "Mobilization Regulations," a list of the medical field units shows the following: (1) A cavalry field ambulance. (2) A field ambulance. (3) A general hospital. (4) A stationary hospital. (5) A clearing hospital. (6) An ambulance train. (7) A hospital ship. (8) An advanced depot of medical stores. (9) A base depot of medical stores. (10) A sanitary section. (11) A sanitary squad. The war establishments and some useful notes on each of these units will be found in the "Field Service Manual, A.M.S.," section 2. Time does not permit of the details being discussed here.

For the sake of description we may consider that these units are composed of (*a*) personnel, (*b*) *matériel,* (*c*) animals. Taking these *seriatim,* we have:—

(*a*) Personnel.—The principle involved in the supply of personnel to

[1] Delivered to officers, Royal Army Medical Corps, Dublin, November, 1911.

field medical units is that of making each existing company of the R.A.M.C. a nucleus or centre from which the personnel of the field units mobilizing in its vicinity are supplied. In order to render this practicable, the company is reinforced by regular and special reservists, who are ordered to join it by the O. i/c records, Aldershot. The actual number of regulars and reservists for each field unit is laid down in the "Mobilization Instructions for the Army Medical Service," and these are despatched to the unit from the company. A point to bear in mind is that in each field unit, excepting the sanitary units and the store depots, there will be a considerable percentage of reservists, who will require instruction in their duties on every available opportunity after the formation of the unit, to make them fully efficient. In peace time, when a man is appointed to a field unit he is given a card, on which is stated the name of the unit he is to join on mobilization. This card is shown by him at each kit inspection.

The officers of field units are detailed by principal medical officers, and receive their instructions through the office of the administrative medical officer on A.F. C. 347-16.

(*b*) *matériel*, i.e., war equipment, is subdivided into (1) Personal equipment and (2) Regimental equipment.

(1) For brevity it is proposed to include the man's equipment, clothing and necessaries, under personal equipment, in fact his kit. The greater part of the field kit of the men of the R.A.M.C., is formed from the kit in each man's possession during peace time. It is supplemented on mobilization by an issue of certain articles, such as a Wolseley helmet, brassard, first field dressing, &c., which are obtained by the company from the ordnance stores. The kits of the reservists are stored at the headquarters of the company, each kit being packed up in a separate bundle and kept in a pigeon hole, labelled with the name of the individual concerned. In each kit there is a card, A.F. H. 117, on which each article of his clothing is entered, his equipment is given on another card, A.F. G. 1,090. Waterproof sheets and blankets (the number of the latter will be stated in the mobilization orders) are also drawn from the ordnance store and issued to each man. Identity discs, emergency rations, and a soldier's pay book (A.B. 64) are duly issued by the company.

(2) Regimental equipment comprises vehicles, harness, saddlery, stretchers, blankets, cooking utensils, lanterns, &c., and is held on charge in peace time, for the medical unit, at the ordnance stores. It is tabulated in the mobilization store tables A.F. G. 1,098 series. This is a printed list of the whole of the equipment of the unit concerned. On mobilization a fatigue party with the necessary transport is sent to the store to draw it. No requisition is necessary and if time is insufficient to check the equipment the counting of the ordnance store department must be accepted as correct, and experience proves that it almost invariably is so.

Medical and surgical equipment is obtained from army medical stores. No requisition is necessary, A.F. I. 1,209 being used as a voucher. A reference to the field service manual A.M.S. Appendix No. 4, gives full information as to the requirements for the various units. Medical comfort panniers are held on charge, ready to issue, at the military hospital at the station where the field unit mobilizes and will be issued "complete," i.e., full of medical comforts, &c.

Veterinary equipment for those units to which it is issued will be obtained under arrangements made with the senior veterinary officer of the station.

The duties of the O.C. of a medical field unit on mobilization somewhat overlap those of the O.C. of a company R.A.M.C. so it will be perhaps better to mention those of the latter officer first. These are detailed in paras. 174 to 185 Regulations for Mobilization, and are shortly as follows:—(1) Recall all on leave. (2) Arrange for medical inspection of all, including reservists, as they arrive. (3) Arrange for rations and accommodation of reservists and others joining. (4) Obtain the life, identity and reserve certificates from reservists and forward these to the accountant paying reservists. (5) Issue personal equipment, clothing, &c., to the reservists who pass the preliminary medical inspection. (6) Despatch R.A.M.C. and reservists to their field units, with nominal rolls on which is a record stating that each man has received a complete set of equipment and clothing, &c., as shown for reservists on A.Fs. G. 1090 and H. 1117. (7) Despatch each evening to the O. i/c records, separate nominal rolls on A.F. D. 442, of the reservists sent to each unit, showing: Date of joining the company, amount of remittance, if any, to be sent to his family, and any charges for messing at the company, &c. The names of any reservists who are found unfit will be included and their disposal noted. (8) If any reservists are unavoidably detained and taken into pay of the company, A.F. D. 418 will be sent to O. i/c records and O. 1796 to accountants.

The duties laid down for the O.C. of a unit, paras. 186 to 220 refer to the O.C. of an existing unit, such as an Infantry Battalion, which is mobilizing, and are so nearly allied to those of the O.C. a company R.A.M.C., who is providing for field medical units on mobilization, that the following duties would appear to devolve upon the latter officer in addition to those mentioned above. I have quoted the No. of the para. in "Mobilization Regulations" in support of this assumption, but have only given extracts from the paras. :—

Para. 199.—Inform O. i/c records of casualties among reservists.

Para. 200.—Render as soon as possible A.F. D. 418 (Separation allowance) to O. i/c records.

Para. 201.—Complete and issue A.B. 64 (soldier's pay book) and see that entries on p. 3 are signed by the man and duly verified.

Para. 202.—Render A.F. O. 1,796 (allotment of pay) to the accountant who pays the reservists.

Para. 205.—Despatch the medals of soldiers to the O. i/c records.

Para. 206.—Despatch wills of soldiers as above, if they desire it, for safe custody.

Para. 208.—Check kits of R.A.M.C. and exchange any unserviceable articles, garments, boots, &c.

Para. 209.—See that all personal equipment, clothing, and necessaries issued on mobilization are properly marked.

Para. 212.—Draw supplies and issue emergency rations.

Para. 220.—Instruct reservists to dispose of their plain clothes, for if these are left behind it will be at the man's own risk.

Draw and issue the special articles of clothing, Wolseley helmets, &c., if required, and see that every man is in possession of a brassard, first field dressing, identity disc, waterproof sheet and the number of blankets notified in mobilization orders.

Apparently mobilization would be facilitated if there were a clearer understanding regarding the duties to be carried out by the O.C. of a company R.A.M.C. and those to be performed by the O.C. of a field medical unit. For instance, it will be difficult for the latter to mark clothing, complete A.B. 64, report non-arrivals and casualties among reservists, &c. The O.C. company receives all information regarding reservists, not the O.C. unit, from the O. i/c Records. If, as is usually the case, a company R.A.M.C. has to furnish personnel for several field units, who are all mobilizing in the close vicinity it would appear to be a more expeditious procedure for the company to retain the personnel under their own control for the first, or even the second, day of mobilization and to furnish the fatigues for drawing tents and equipment for all the field units in rotation, until the arrival of the reservists. If, as is apparently contemplated, the men are to be drafted out to units early on the first day, the hospital will be depleted of many of the personnel who are essential for carrying out the actual duties of preparing the reservists for joining their field units, i.e., the quartermaster and his staff and the sergeant-major and the clerical and pay staff to a large extent. With a few men and a couple of N.C.O.s to perform police duties, &c., the O.C. of a field unit could temporarily look after his stores and he could take over his equipment equally well if the work were performed by the fatigue parties from the hospital. The central control for drawing stores according to time tables would equalize labour, liberate many men for duty at the hospital, and expedite the work in several respects.

In case of mobilization for service abroad it would seem to be desirable to take over as much of the equipment as possible, packed in bales, &c., from the ordnance stores and ready for shipment. Repacking by the men of the medical unit may not be carried out too skilfully, and may result in damage during transit.

Notes: The documents of reservists, viz: A.B. 64, A. Fs. B. 121, and B. 178, and duplicate attestation with any documents it contains are

forwarded by the O. i/c. records when he receives the A.F. D. 442 (nominal roll) from the O.C. company.

Any books or documents that are not to go with the unit are to be handed over to the company.

Any regimental or personal baggage that is not to go is to be handed over to the company. A list of the latter signed by the owner should be made.

In general mobilization Field Service rations are to be drawn for the first day of mobilization, and two days' grocery ration drawn and held in reserve. In partial mobilization orders as regards Field Service rations will be issued.

Supplies: For scale of rations see para. 27, allowance regulations (1910). For forage see paras. 158-161, allowance regulations (1910). For fuel and light see paras. 247-248, allowance regulations (1910). All above will be drawn on A.B. 55.

Duties of the O.C. of a Field Medical Unit. (*a*) In peace time (*b*) On mobilization being ordered.

(*a*) *In peace time.*—To periodically inspect the equipment of his unit.

To draw up mobilization orders for his unit and a time table for drawing equipment, &c. He is informed confidentially of the particular day and time on which the several stores concerned can make the issues to him.

He must ascertain from the O.C. of the company R.A.M.C., whether all or only a portion of the duties mentioned above are being arranged for, and whether the necessary transport and fatigue parties are requisitioned for and detailed, and must make his own arrangements accordingly. He should as far as possible make himself acquainted with the personnel of his unit, and should write to officers of the special reserve to keep him informed of changes of addresses, &c.

Arrange with O.C. A.S.C. to send men to draw horses, if any, for his unit on the day arranged for issue. Ascertain from him also the number of the company A.S.C. to supply the N.C.O.s and men A.S.C. for the unit, and if possible see the officer in command of the company in question. Write to the senior veterinary officer and ask where and on what day of mobilization the veterinary equipment can be drawn. Example of a time table, and orders :—

Date and time		Articles	Place
First day,	7 a.m. ..	Tents for personnel.. ..	Ordnance Store, A Barracks.
	8 a.m. ..	Rations and groceries ..	Supply Depot, B Barracks.
	3 p.m. ..	Ordnance equipment ..	Ordnance Store, C Barracks.
	6 p.m. ..	Special articles of clothing..	Ordnance Store, A Barracks.
Second day,	9.30 a.m...	Medical and surgical equipment	Army Medical Stores, D Barracks.
	10 a.m. ..	Medical comfort panniers ..	Quartermaster's Stores, Military Hospital.

Date and time	Articles	Place
Third day, 7 a.m. ..	Horses	Remount Depot, A.S.C. Stables.
8.30 a.m...	Extra blankets	Ordnance Store, A Barracks.
3.45 p.m...	Reserve supplies	Reserve Supply Depot, E Barracks.
5 p.m. ..	Hand over any books, documents, baggage that are not to be taken	R.A.M.C. Company Store, Military Hospital.
Fourth day, 9 a.m. ..	Return any surplus equipment	Ordnance Store, A Barracks.

On the following pages of the time table full details are to be given as to length of time allowed for drawing the stores, &c., and all other necessary information.

Orders by Lieutenant-Colonel X. Commanding No. 1 Field Medical Unit.

For First Day.

(1) The undermentioned having reported their arrival are taken on the strength and posted to sections and sub-divisions shown against their names.

(2) An order giving time of réveillé and meals.

(3) All ranks will remain in camp unless otherwise ordered.

(4) An order for the necessary fatigue parties for drawing stores, &c., (unless this has been arranged for by the O.C. company R.A.M.C.), also an order appointing temporary camp police.

As only a few of the personnel can be expected to arrive on the first day these few orders should meet requirements. For the second and third days the orders will require to be a little more elaborate; for instance:—

Orders by Lt.-Colonel X, Commanding No. 1 Field Medical Unit.

For Second Day.

(1) *Detail.*—Officer on duty, Lt. A.; next for duty, Lt. B.; detail of N.C.O.s, police, fatigue parties, &c.

(2) *Arrivals.*—The undermentioned having reported their arrival, &c. (Similar to the first day's order on the subject).

(3) *Reservists.*—An order giving the ranks, rates of pay, corps pay, &c., of all reservists.

Army Service Corps,—An order taking these on the strength, and a similar order to No. (3) regarding A.S.C. Reservists.

The above are intended only for a very rough guide.

Duties of the O.C. of a Field Medical Unit on Mobilization being Ordered.

(1) To ascertain from the Principal Medical Officer's office the time and date the officers of the unit may be expected to arrive and to make arrangements for their tents, messing and temporary servants.

(2) To proceed to the headquarters of the company, R.A.M.C., and verify the former arrangements, made in peace time.

(3) To collect any personnel available and proceed with them to the place of mobilization and make preparations for the arrival of the reservists, such as marking out the camp, horse lines (if required), and see that conservancy arrangements are satisfactory.

(4) Arrange for the veterinary inspection of horses and for having them shod. The fitting of harness should be commenced directly the animals are available. It is usually a long business. The harness when received from ordnance store is not in sets for each animal, but in lots, so many bits, headstalls, traces, reins, &c., and it is well to have these arranged in sets before the horses arrive to save time.

(5) The O.C. should, as far as he possibly can, attend himself to draw all stores, but if this is not practicable an officer of the unit must be sent, unless the quartermaster has joined, which is improbable, as for the first few days he will be fully occupied in his company fitting out reservists. Failure to send an officer may cause great delay. As regards saddlery field officers must supply their own, that for other officers should be requisitioned for from the ordnance store.

(6) Forward a progress report at the end of each day to the Senior Medical Officer.

Para. 62 Mobilization Regulations states that units which require horses will telegraph to the general officer i/c administration of the command in which they mobilize the number and classification of animals (including officers' horses), which they require to complete their units to war establishment. This, however, will probably have been arranged for previously during peace time as regards a medical unit, also the day of mobilization on which the animals are to be sent for, and the place settled.

The following points should be remembered: (1) That families of serving soldiers may remain in married quarters or be sent on warrant to any destination they desire in the United Kingdom. (2) If mobilization is for service abroad "Details left at the base" mobilize and proceed with their units. (3) Accounts of men proceeding abroad on active service will be closed on the day preceding that of embarkation. Vide paras. 131, 126, and 79 Regulations for Mobilization respectively.

It may be mentioned that arrangements are made between the War Office and the Order of St. John of Jerusalem and St. Andrew's Ambulance Association for members of the Home Hospitals Reserve to replace R.A.M.C. withdrawn on mobilization from military hospitals at home.

In conclusion an example of the emergencies that you may suddenly be called upon to meet may not be inappropriate. Let your thoughts go back to the earlier events of the South African War. Imagine that you are the medical officer of a battalion, which was at the battle of Talana Hill, and the retreat from Dundee, and that your regulation books, &c.,

have been lost or destroyed by wet. Your battalion is encamped some eight miles north of Ladysmith, and is to form one of a new brigade. You receive an urgent telegram from the P.M.O. to mobilize a bearer company as soon as possible, which on emergency must be capable of treating wounded after an action, i.e., practically what is now termed a field ambulance. Later further instructions arrive in which you are told that three staff serjeants and a serjeant R.A.M.C. are being despatched to assist, but that you must procure the remainder of the personnel from other medical units, and that only men enrolled in South Africa can be spared. If you require any extra men to bring the unit up to strength you may apply for newly enrolled men from Durban. Equipment will be obtained from Durban and Maritzburg through the ordnance field depot at Ladysmith. You must try to get your animals from the nearest remount depot. This is two miles on the other side of Ladysmith. Medical equipment and comfort panniers are to come from Maritzburg. Bear in mind that you cannot leave your battalion for more than a day. You have no books of regulations, and cannot get any. No one to pester with questions as there is only an Indian field hospital in the camp, and the other medical officers of battalions are civil surgeons. Durban is 140 miles, and Maritzburg about 100 miles away. The nearest railway goods delivery office is in Ladysmith. Think over the circumstances, and you will appreciate some of the difficulties that were experienced, and which will be referred to in the lecture on duties of the R.A.M.C. in the field.

NO. 2.—DUTIES OF R.A.M.C. IN THE FIELD.

A COMPREHENSIVE description of these duties will be found in the latest edition of the Training Manual, R.A.M.C., so it is only proposed to allude to a few instances in which some uncertainty as to the best course to adopt has arisen. The mobilization of the bearer company, mentioned in the last lecture, is a case in point. A vain attempt was made, after despatching telegrams to the Ordnance, Remounts, and Transport Officers, to personally collect the men, animals and stores, and by hard riding, to interview the officers concerned. This proved a failure in several ways, such as finding that troops had moved their camps, or that the officer sought was away on duty, &c., and what was still more irritating, on returning after a long, fruitless journey, was to be handed telegrams that had arrived early in the day, and should have been replied to without delay. There is little doubt that under the circumstances, the better plan would have been to have remained at the end of the telegraph wire until arrangements had been definitely settled, for when this method was adopted progress became rapid. One point worth noting is that when the telegraph department is congested it is as well to confirm all telegrams by letter.

The men of the Bearer Company, all of whom were enrolled in Natal, were of various nationalities and were mostly tradesmen. They had the free and easy colonial manner and little appreciation of discipline. It required a considerable amount of tact on the part of the N.C.O.s to run things smoothly. One man, however, proved quite intractable and was discharged, as he refused to obey any N.C.O. in the British Army. He went off threatening to see his lawyer about the matter. The animals were a difficult problem for the O.C. Remounts for the Natal Army had practically cleared the country. As a last resource he collected a hundred and twenty horses that had been cast from the mounted corps, and from the trouble they gave to break in, vice seemed to have been the reason for casting them. Only a few had been broken to harness, so this had to be done in camp, and for a long time the troops styled the Bearer Company "the 8th Brigade circus." By steady daily training both men and horses learned what was required of them, and for eighteen months did good work in the field. The unit first came under fire at Laings Nek, but had no work to speak of. At the taking of Amersfort, wounded were collected from the whole of the area covered by the Brigade. A problem arose here, for the field hospital had been left moving along a road ten miles in rear, and its whereabouts was unknown. Was it better to send the wounded back on the chance of finding it, or to take them forward into the town and look after them for the night there? We decided on the latter course, as being best from the patients' point of view, and transferred them early next morning after a comfortable night's rest in the hotel. This plan deprived the unit of most of its ambulance wagons for thirty-six hours. Some of the other bearer companies decided to send their wounded back directly after the fight, but only got them to their hospitals after wandering about most of the night. There was one great point in their favour, however: their ambulance wagons rejoined them quite twelve hours before ours were able to catch up.

One afternoon later on, just before the Force reached camp there was a good deal of firing along the front, but the occurrence of a very perceptible earthquake shock suddenly put an end to it. Bearer parties were sent out, but could hear of no casualties. About 8 p.m. a man came into the Bearer Company camp and said that a small party he had been with had been ambushed by the Boers about three miles away, and were lying out there badly wounded. Taking the man as a guide the Bearer Company went out. The night was just dark enough to make it difficult for the ambulance wagons to travel. Searching the ground took over two hours, as the bearers were inexperienced, and the whole area had to be gone over a second time to ensure that no wounded had been missed. Twenty-seven were found and brought in, and a party of bearers left to look over the ground also returned with one after daybreak. As a considerable amount of unnecessary fatigue was thrown upon the searchers by having to go over the same ground twice, and in some places

three times, owing to their persistently collecting into groups and missing portions, attention was given to the subject of night work, and training practised in daylight, so that the men could appreciate what went on in the dark.

The following plan was evolved, which is suggested as a guide until some more efficient method is recommended, as there is not much assistance to be derived from the regulations:—

The searching is carried out by an extended line of bearers. Two bearers of each stretcher squad carry the stretcher, the other bearers of the squad are extended between each stretcher at an interval of about ten paces from the squads and from each other. Thus a squad of six bearers will cover a frontage of forty paces. If the night is very dark an interval of seven or eight paces may be found preferable, for each bearer must be instructed to keep the men on either side of him in sight as the line moves on and at the same time to search the ground he passes over. The controlling officer should march in the centre of the line and one officer on the extreme flank on each side. Other officers if available should be distributed at intervals along the line. Orders are issued by passing the word along the line from man to man. The officers on the extreme flanks report to the centre every five minutes by "Pass the word All's well on the right (or left) flank." This report informs the controlling officer that his line is connected up, for failing to receive it he at once orders the line to halt and takes steps to connect any break in the formation. This is in reality an extra precaution, for each bearer is instructed, that if at any time he loses sight of either of the men next him, he is to immediately "Pass the word Halt, the line is broken at (give number) squad." On the line being halted the officers and N.C.O.s connect it up and when accomplished the word is passed in that "All's well." The controlling officer then passes out his orders to advance or retire as the case may be. With a little practice in daylight a line of extended bearers can soon be taught this, also to change direction or incline. Once they have seen the movements carried out, it is surprising to find the ease with which searchers covering upwards of a mile of frontage can be controlled in the dark. All movements must be carried out at a slow pace unless circumstances allow the use of lanterns. If many wounded are likely to be found it as well to retain a few stretcher squads in reserve to complete the line when bearers have to fall out to take the wounded to the ambulance wagons or to a collecting station. Eighteen stretcher squads and N.C.O.s thus extended would cover a frontage of about 930 paces, i.e., nearly 800 yds. Some objectives, such as a star, or a distant light, or the top of a hill if visible on the sky line, pointed out to the men for showing the general direction, before starting, is a help. Untrained men will march too fast on the flanks and are inclined to bunch toward the centre, with the result that a slowly closing crescentic formation results and the area of ground searched is

considerably reduced. Luminous compasses are useful on these occasions. Remember to notice that the north star you think you have found must form the end of the tail of the little bear, or else you have got hold of some other star by mistake.

While considering night-work it might be as well to touch upon a few other points. In field service regulations night operations are classified as "Night Marches, Night Advances and Night Attacks, and the fact is pointed out that Night Attacks, that is to say, attacks delivered in the dark, should rarely be attempted by a force larger than an Infantry Brigade against a single objective unless the conditions are exceptionally favourable."

For night marches all that is generally required is to see that sufficient ambulance wagons are detailed to march in rear of the last vehicle of the column to pick up sick and stragglers.

In night advances transport or other vehicles are, as a rule, left behind, so if an attack is to be made at dawn the bearer divisions of field ambulances, less their wagons, but reinforced by the personnel of a tent sub-division or two, may be sent with the troops, the wagons being sent for later, when the action develops.

For night attacks it is a debatable question as to whether an effort should be made to render aid to the wounded during the attack or to keep the medical personnel in reserve ready to be distributed over the ground when the fighting ceases. In most cases the latter course would probably be the better. The formation to be adopted must vary with the ground and with the special circumstances of each case, (*vide* F.S.Reg., p. 166, para. 7). Instances, however, may arise in which it is essential that the wounded should be got away before daylight, so it is as well to have some sort of a scheme to base arrangements upon. In the first place the medical officer should be given an opportunity of reconnoitring the ground as far as it is possible and should be shown any maps or sketches that are being used for arranging the attack. He should be made aware of the formation of the attacking troops and all orders either written or verbal issued to them. He must then decide whether the bearers should accompany the troops forming the reserve from the position of assembly to the position of deployment or beyond it, and the place where the remainder of the personnel will be in readiness. The route to be taken by ambulance wagons must be decided, as after the action it may be found practicable to make use of them. In most cases it will be advisable to issue orders for grouping wounded whilst the area is being searched. This search should be carried out close to the new position taken up by the troops as well as in rear, so that any of the enemy, wounded in their retreat, may be collected from the entrenchments, &c., as they may hamper our troops if left, in addition to the fact that they must receive care and attention.

Before a night attack it is very important to thoroughly explain the arrangements to every individual concerned with the removal of the wounded. After the bearers have moved off in the dark there is no countermanding your orders, much as you may desire to do so.

Night attacks may be made by the enemy on our troops, by no means a rare event in the South African war. The attack on Wagon Hill was one of the most severe. It commenced at 2.20 a.m. Several instances could be mentioned which occurred on nights when the troops considered themselves safer than they had been for months previously. At Lake Crissy our cavalry had chased the enemy for 20 miles after the force encamped, but the enemy were busily at work well inside our camp by 4 a.m. next morning. On active service not only the O.C. a medical field unit but also every officer in medical charge of a unit, however small, should have a plan made, and his bearers shown where to bring wounded, in the event of a night attack.

When a force is retreating at night it is as well to leave a sufficient number of stretcher squads, not too many, with the rearguard and a couple of light ambulance wagons or a couple of carts. These are intended to run up wounded to the heavy ambulance wagons, which should march in rear of the transport. The light wagons or carts return to the rearguard after transferring the wounded. It is not desirable to have more bearers, &c., with the rearguard than are actually necessary, for the risk of their becoming casualties themselves and consequently delaying the force has to be remembered.

The subject of night operations deserves careful consideration, for it seems probable that in wars of the future movements under cover of darkness will be frequently resorted to so as to counteract in some measure the value of information gained by aeroplanes regarding the dispositions of troops; training at night might be carried out from barracks occasionally during the winter evenings, say from 5.30 to 7 p.m., without much inconvenience, and a considerable amount of experience gained. The old soldier seldom loses much on night manœuvres, but the recruit not infrequently loses his belongings and himself as well.

There is a point with regard to field work that it may be useful to discuss. After a heavy action, sometimes great pressure occurs in the field ambulances. There are often large numbers of lightly wounded men to be dealt with, and the usual practice is to hustle them off to the rear as soon as possible. This is without doubt the best plan with regard to the majority, but a few may be of considerable assistance in the field unit. They can be employed in many ways, such as looking after fires, watching cooking pots, distributing beef tea, sitting by a severely wounded man, helping the pack-store keeper to check arms and equipment, assisting the clerks, &c., and so relieve orderlies for other duties.

In criticisms of manœuvres where the collection of large numbers of casualties from the field has been practised, severe comment has been

made on the delay caused by the names of the wounded having to be recorded, before the men were admitted. On service it is very necessary to have a nominal roll of wounded made with as little delay as possible. The Staff will want it and will have it whatever else happens. When wounded are being admitted in hundreds the clerical N.C.O.s and men become harassed and cannot compete with the work. To meet such emergencies the following plan was arranged for at the last 5th Divisional Training, but unfortunately owing to the railway strike the training was cancelled on the day of assembly, so the scheme could only be tested on a small scale.

The idea was to divide up the work as much as possible. A supply of small books similar in size and shape to A.B. 36 (the outdoor prescription book) was issued to the field ambulance. The pages were perforated along the inner margin to render them easily detachable and were ruled with columns for Corps, Number, Rank, Name, Injury, Remarks. Lead pencils were attached to the books. Orderlies who could write clearly were selected for the duty of ambulance wagon orderly, and a book was issued to each with instructions to enter the required particulars regarding every patient received into the ambulance wagon under their charge. They were to take every opportunity of doing this either while the wagon was being loaded or on the way back to the field ambulance. On arriving at the field ambulance the pages on which the entries had been made were to be detached from the book and handed to the clerk. On receiving the pages the clerk was to indicate the number of the tent to which the patients were to be taken, put the tent number on the pages and then file them on a piece of wire. The patients would thus be dealt with as far as the clerk is concerned, at least for the time, as quickly as they could be unloaded from the wagons. The clerk was also provided with spare books and pencils.

If a large number of lightly wounded walk into the field ambulance, in all probability there will be some N.C.O.s among them. The clerk could give a book and pencil to each N.C.O. and tell him to enter the particulars of, say, eight or ten men, and then bring the book and the men to him. The clerk would then tell off the men to their tents or shelter, make an entry of the number of the tent or shelter on the pages that have been completed by the N.C.O. and then detach and file them.

If N.C.O.s are not available there will practically always be some of the wounded who are signallers, or clerks, or men, who can take down the names of a few others correctly. If time permits the clerk should, of course, glance over the pages to see that the entries are legible. One clerk alone can carry out these measures for a whole field ambulance and the others can be making entries in the A. and D. book and A.F.A. 36 from the pages already filed. If only one clerk can be spared, as for instance in a short-handed tent subdivision, he must himself take the opportunity of any lulls in the arrival of wounded to enter up his A. and D

book and A.F.A. 36, from his file. When an opportunity occurs he must ascertain from his officers the names of the wounded who are to be classified "dangerously" and "severely." As soon as the A.F.A. 36 has been sent off, he should complete the columns of his A. and D. book as regards religion, &c., by going round the tents. He will have a fair idea of the whereabouts of most of the patients from the entry of the tent number which he made on the filed pages.

If any officers have an opportunity of trying this or any other plan they may devise for overcoming the difficulty, which is a real one, it would be well worth the time expended. In the next lecture it is proposed to continue dealing with duties in the field, more particularly those which may occur in so-called savage warfare as experienced in the Bazar valley and the Mohmand expeditions, in 1908.

Reviews.

THE PARASITIC AMŒBÆ OF MAN. By Charles F. Craig, Captain, Medical Corps, United States Army. London: J. B. Lippincott and Co., 1911. Pp. x and 253. Price 10s. 6d. net.

When a man who has had an enormous experience of a particular subject sets to work to describe the results of his observations, and when, in addition, he is endowed with a capacity for exposition in clear and simple language, his book is generally worth reading, and so it is with the volume before us. Captain Craig's writings are already familiar to those who keep themselves abreast of the current literature in Tropical Medicine, and in this monograph he gives us a clear account of the present position with regard to our knowledge of amœbiasis. After dealing with the history of the subject, he first takes up the biology and classification of amœbæ in general. Then comes a valuable chapter on technique, in which the many difficulties that surround this part of the subject are dealt with in a manner which we would expect from one who has himself faced the difficulties. He insists on the necessity for examining fresh specimens for purposes of diagnosis, and he points out the great frequency of *Entamœba coli* in the stools of normal people. This is a point which it is very necessary to keep in mind when dealing with the diagnosis of diarrhœas and dysenteries in patients from tropical countries and it emphasizes the necessity for having a clear conception of the characters of pathogenic as distinguished from non-pathogenic entamœbæ. Captain Craig points out that the classical descriptions of entamœbæ are more or less composite pictures and that an opinion must be based on observation of a number of parasites. *E. coli*, *E. histolytica*, *E. tetragena* claim the greater share of attention, but the other entamœbæ

whose position is not quite so certain are dealt with as fully as our knowledge permits. Among more controversial points the writer maintains his well-known position that parasitic entamœbæ have never been grown in culture and that the growths which have been obtained have been those of free living amœbæ (*Amœba limax*) whose spores have been swallowed. He bases his opinion on his own failure to grow entamœbæ after repeated attempts and on the fact that cultured amœbæ show a contractile vacuole and spinose pseudopodia, characters which never occur in entamœbæ and which are common in free living amœbæ. It is a little difficult to explain in this connexion the reported successes in growth of entamœbæ from liver abscess material, and in the same connexion there occurs to one's mind the dissimilarity between the cultural and parasitic forms of kala-azar. The book is very interesting, very readable, and will well repay study by all those who are interested in tropical medicine, whether from a practical or a scientific point of view.

W. S. H.

Kala-azar Bulletin, No. 1.

This new publication, issued under the direction of the Sleeping Sickness Bureau, is planned on similar lines and has the same objects as the other special bulletins, such as those devoted to yellow fever and to sleeping sickness. The first number has a review of experimental work on the transmission of kala-azar to animals; the disease, as is well known, is, in its Mediterranean form, transmissible to dogs and monkeys, whilst, so far, all attempts at transmission of Indian kala-azar to animals have failed. Another interesting review is on the transmission of kala-azar (Mediterranean form) by means of blood-sucking arthropods. The most striking of the results obtained have been those by Basile and others on the transmission of the disease from dog to dog by means of *Pulex serraticeps*. The evidence of this transmission is twofold, viz., the actual infection of dogs by bites of the fleas which had been collected from infected dogs or from infected quarters, and the finding of flagellates resembling the cultural forms of Leishmania in the gut of a number of the fleas. The first is the more convincing, since one knows of the many pitfalls connected with the finding and identification of flagellates in the body of blood-sucking arthropods and insects. Though it must be said that from Basile's observations it appears that fleas carrying flagellates which resemble the cultural forms of kala-azar are rare.

A review of experimental work on Oriental sore gives some very interesting details on culture of the parasite and on transmission experiments; the disease has been transmitted to man, dogs and monkeys by inoculation of material from sores and by cultures; the incubation period is often very long (seven months in one case). Experiments showed that re-inoculation into a subject who had completely recovered shortly before was unsuccessful on account of immunity, but that if it was practised before the sore had healed there was hyper-susceptibility, rather than immunity, the second sore appearing after a shorter incubation period than normal. Similar hyper-susceptibility has been found to occur in dogs suffering from kala-azar and which were re-infected. It suggests the propriety of removing patients suffering from kala-azar as soon as possible from the environment in which they contracted their

disease. An interesting observation is noted, that animals which have recovered from kala-azar are immune to Oriental sore. Many other interesting papers are reviewed, but it is impossible to refer to more than those which seem to have an interest for general workers as well as for specialists.

W. S. H.

Recent Methods in the Diagnosis and Treatment of Syphilis; The Wassermann Serum Reaction and Ehrlich's Salvarsan. By Carl H. Browning, M.D., and Ivy Mackenzie, M.B. Constable and Co. Pp. xxvi. and 302. Price 8s. 6d. net.

The authors of this book were early workers at the Wassermann test, and, with their collaborators, Cruickshank, Chislett, Gilmour, and Morton, have contributed many valuable papers on the subject to the *Journal of Pathology* and other scientific journals. Their researches have contributed much to the attainment of a more exact knowledge of the complex processes which are involved in the Wassermann reaction, and it would have been a loss to science if the accounts of them had remained scattered in the sixteen papers they have published at various times. They have done well, therefore, in collecting these papers and adding more original work of their own to build up a systematic treatise on the Wassermann reaction. This, with an excellent account of the treatment of syphilis with salvarsan, makes up the book under review.

The introduction by Professor Muir reveals the scope of the work, and describes generally the lines on which the authors and their collaborators have worked. It would be impossible to deal here even with a tithe of the valuable and suggestive information to be derived from a careful study of this book, and we can mention only a few of the more important points to indicate the scope of the authors' researches and the complexity of the processes which underlie the Wassermann reaction. Investigating the nature of the several constituents of the test, they find that complement derived from different guinea-pigs differs not only in its hæmolytic power, but in its deviability. They conclude from this that, as a preliminary to the test proper, it is necessary not only to titrate out the hæmolytic activity, as is usually done, but to estimate the number of hæmolytic doses which are deviated by the patient's serum alone and by the extract alone. They mention that in their researches they have had to reject some samples of guinea-pig complement on account of their hypersensitiveness to the patient's serum. In contrast to some other workers, they find that the best estimate of the content of a serum in Wassermann substances is afforded by the number of hæmolytic doses of complement which a constant amount of it will deviate when incubated with a constant amount of extract. In this they disagree with those who vary the amount of the patient's serum, and keep the extract and complement constant. The authors hold that there is an optimum amount of patient's serum for a given amount of extract; twice or more times this amount of serum will not necessarily deviate more complement, and may even deviate less. We concur in this view, which agrees with the findings of workers with bacterial antigens and true antibodies. The authors have done a great amount of work with the object of eliminating such undesirable constituents of crude extract as hæmolysins and anticomplementary bodies. As a result of their work in this direction, they have elaborated

a new complement deviation test for syphilis which, if events justify their claim, should do much towards standardizing the Wassermann test and increasing its delicacy. Briefly, they find that lecithin extracted from ox-liver has much less anticomplementary power than crude extract; that the addition of cholesterin to this lecithin does not greatly increase its anticomplementary power; and that while normal serum incubated with lecithin-cholesterin mixture does not deviate more complement than when incubated with lecithin alone, syphilitic serum absorbs decidedly more under the same conditions. If, as the authors claim, the deviation of more doses of complement with lecithin-cholesterin mixture than with lecithin alone is a property which is strictly specific to syphilitic sera, the test will be a very valuable one for detecting weakly acting syphilitic sera.

The last 142 pages of the book are devoted to the treatment of syphilis with salvarsan. Included in a very full account of this remedy are detailed notes of every death which had been attributed to it up to the date of going to press. The authors discuss very fully the question of nerve disturbances after salvarsan treatment, and the facts they have collected relating to the so-called neurotropic effect of salvarsan will allay much of the alarm which has been created by many of the incomplete reports which have been published, often at third hand, on this subject. The only complaint we have against the section of the book which deals with salvarsan is that we could find nothing in it on the prevention of reaction after intravenous injection.

We commend this work to our readers as not only the most scientific on the subjects with which it deals, but also the most useful from the practical point of view.

L. W. H.

AIDS TO OPHTHALMOLOGY. By N. Bishop Harman, M.A., M.B.Cantab., F.R.C.S.Eng., Lecturer in Ophthalmology West London Post-Graduate College, Assistant Ophthalmic Surgeon, West London Hospital, &c. With one hundred illustrations. Fifth Edition. London: Baillière, Tindall and Cox. Pp. viii. and 216. Cloth, 2s. 6d. net; paper, 2s.

This is an excellent little work of its kind, and we can strongly recommend it to specialist students at the College as a "refresher," prior to examination. Non-specialists and general practitioners will also find it useful, as it contains in portable and compressed form practically all the essentials of ordinary ophthalmic work, and the numerous illustrations are most helpful. A feature of the book, unique in a manual of this kind, is the very lucid chapter on "Eye Conditions in School Children," which should be read with care by all medical inspectors of schools. The vision regulations for the various public services would be a desirable addendum in future editions.

M. T. Y.

THE ACCESSORY SINUSES OF THE NOSE IN CHILDREN. By Professor Dr. A. Onodi, of Budapest, with preface by Professor Dr. W. Waldeyer. Price 21s. London: Bale, Sons and Danielsson.

Information to be derived from our various text-books on the accessory sinuses of the nose in children is meagre and often contradictory.

In this unique work, plates from photographs of 102 specimens of skulls of infants and children are presented in their natural size. By

these means the clearest idea is afforded of the development of the sphenoidal and frontal sinuses, the ethmoidal cells, and the maxillary antrum.

One of the most interesting discussions this year at the Laryngological Section of the Royal Society of Medicine took place on "Treatment of Purulent Discharges from the Frontal Sinuses." References were made by all speakers to the extraordinary vagaries of position, size and shape of the frontal and other air sinuses.

A study of Professor Onodi's atlas, showing the exact anatomical relationship of the parts with accurate measurements, cannot fail to be of the greatest service both in diagnosis and treatment. The author, after carrying out experiments on 1,200 skulls, lays much stress on the unreliability of electrical transillumination of the air sinuses for purposes of diagnosis, especially in children.

Skiagraphic results, he is confident, are much more to be relied on, though they too are not infallible. It is along the lines of such a work as this that our further knowledge of the relations, functions, pathology and treatment of these air cavities must be sought.

The labour of preparing the numerous sections and of carrying out such accurate measurements must indeed have been heavy. Professor Onodi may feel assured that he has gained the gratitude of very many surgeons interested in the diagnosis and surgical treatment of the regions he describes.

G. A. M.

Medical Laboratory Methods. By Herbert French, M.D., F.R.C.P. Third Edition. London: Baillière, Tindall and Cox. Pp. viii. and 202. Price 5s.

Many simple laboratory tests connected with the clinical examination of patients are often neglected because it is impossible to remember the instructions for carrying them out, and it is not always convenient to keep large works on medicine or surgery, which deal with them, in the hospital.

The present work was written to supply the need for a small book in which all the more simple tests were collected, and the fact that it has reached its third edition in a little over seven years is evidence that it has achieved its object. In a small volume, which can easily be slipped into the pocket, the author deals with urine, blood, sputum, pus, gastric contents, fæces, serous fluids, the preservation and mounting of specimens, the examination of seminal stains and tests for the commoner poisons. Naturally, so small a work which deals with so many subjects cannot enter into elaborate descriptions, but those which are given are sufficient to enable the reader to recognize the object of his search and they can easily be supplemented by reading larger works at home.

It must be very difficult to keep a book which covers such a wide range of subjects quite free from error, but we could find very few in this. We would like, however, to mention a few points which seem open to correction. On p. 83 the directions for using Leishman's stain are to filter some on to the film, allow a minute for fixation, and then to add an equal quantity of water. Filtering removes eosin from the stain, fixing for so long favours deposit, and the amount of water to be added is half that which was recommended by Sir William Leishman. In the section which deals with malarial parasites it is stated that sporulation

is seldom seen, and that crescents are not peculiar to any particular variety of malarial parasites. This seems contrary to accepted teaching, and certainly to our own experience. In the examination of a patient for ankylostomiasis, we think it would be much easier to search for the ova, which are not mentioned, than for the parasites. The dark-ground method of demonstrating the *Spirochæta pallida* is not described, and the use of a sharp spoon to obtain material for spirochæta examination seems unnecessarily formidable.

In spite of these points which, after all, relate to very special subjects, we think the reader will find this a most useful book in the laboratory, one which will materially assist his diagnosis by enabling him at once to carry out tests which would often otherwise have to be postponed till a large work could be consulted.

L. W. H.

OUTLINES OF BIOLOGY. By P. Chalmers Mitchell, F.R.S., revised and supplemented by G. P. Mudge, F.Z.S. Third Edition. Methuen, 1911. Pp. xv. and 348. Price 6s. net.

This edition of the elementary facts relating to biology is, when compared with the original volume published in 1894, practically a new book. No less than nine additional chapters are new, and these are devoted to a consideration of the morphology of the ciliated protozoa, the sporozoa or parasitic protozoa, and the gross morphology of dicotyledons together with the minute structure of leaf and root, while the general phenomena of karyokinesis, maturation of the germ-cells and the histology of the blood, and the formed tissues of the epiblast and mesoblast are dealt with at considerable length. These histological chapters are illustrated by excellent plates.

For the Mendelian interpretations which are found in the chapters on the maturation of the germ-cells, Mr. Mudge, whose polemical contributions to Mendelism are well known, is wholly responsible. At present the position of the subject has scarcely advanced beyond the accumulation of an undoubtedly interesting quantity of facts which may only have a limited relationship to the vexed question of heredity. The account of the blood leucocytes is too general, and since no English textbooks contain any detailed description of the morphology either of the blood of the earthworm, dogfish or frog, these might have been included; for example, the leucocytes of the frog are very dissimilar to those of man, the earthworm or dogfish.

There is no mention of the arrangement of the suprarenal bodies in the frog or dogfish, or of the calcareous masses of glands of Swammerdam in the former animal.

For the earthworm a typical transverse section might have been given in a diagram; the one on p. 155 of a cœlomate is neither good nor of much service.

Biological knowledge is in part physiological, and in any future edition of this volume, which from the morphological side deals with this part of the subject so accurately, we would suggest the inclusion of the elementary physiological mechanism by which, for example, the processes of respiration and micturition are carried on in the frog and earthworm. The authors have considered this in the case of unicellular plants and animals.

It appears to us that its great merit as an elementary text-book lies in the fact that it does not assume too much previous knowledge on the part of the reader.

On the whole the book cannot be considered full enough for the preliminary scientific examination of the London University, yet on account of its clearness it should be very useful to the student commencing to study the subject either for examination or otherwise.

W. F. T.

Current Literature.

Serum Therapy in Enteric Fever.—Forssmann (*Deutsch. med. Woch.*, October 19, 1911, p. 1,936) reports a milk epidemic of 428 cases of enteric fever among which the mortality was 8 per cent. To twenty of the more severe cases 20 c.c. of the antityphoid serum prepared by Kraus, of Vienna, was administered subcutaneously or intravenously. Three succumbed. When given early a marked improvement was noted. Kraus himself has observed a decline in the temperature, and a general amelioration of the symptoms after its use. Unger employed it in twenty-eight instances and Russ in forty-four. When the treatment was commenced in the first week of the disease its beneficial action was marked in the course of four or five days. C. B.

The Diagnosis of Enteric Fever.—Perlmann (*Münch. med. Woch.*, October 24, 1911, p. 2,294) has tested the blood of a hundred cases of enteric fever for Mandelbaum's reaction. They all gave positive results, while the bloods of 100 controls were negative.

The method was described on p. 572 of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xiv, for May, 1910. A tube of broth which contains 2 per cent sodium citrate is inoculated with *Bacillus typhosus*. One part of blood and ten to fifteen parts of this broth are drawn into a pipette. After four hours' incubation at 37° C. the bacillus will have grown into long threads in the case of a typhoid blood.

C. B.

Anti-typhoid Vaccination in the French Army.—During the course of a speech in the Chamber of Deputies, the Minister of War announced that during July, 1911, arrangements were made in the district of Oudjda to provide anti-typhoid inoculation for any soldier who cared to submit to it. Many volunteered to have the operation performed. Among those who did so not a single case of enteric fever occurred, while among the non-vaccinated men a certain number contracted typhoid, which in some cases ended fatally. Arrangements have now been made to vaccinate all the troops in Morocco, Algeria, and the Colonies. A great diminution in the typhoid mortality is confidently expected next year.

C E. P.

Anti-typhoid Vaccination — Holland and France (*Le Caducée*, March 4, 1911).—In answer to an inquiry, the editor of *Le Caducée* was

informed on reliable authority that, so far as is known, not a single anti-typhoid vaccination has been carried out in the whole of the Netherlands, either in the Army or civil population; the same holds good for the Dutch Colonial possessions.

In France a Commission has recently investigated the whole question of anti-typhoid vaccination. Its report recommended the employment of anti-typhoid vaccination in all cases where persons are exposed to the risk of infection. This report was discussed at a meeting of the Académie de Médicine, which by a small majority refused to endorse the finding of the Commission. C. E. P.

Serum Diagnosis of Malignant Disease.—Monakow (*Münch. med. Woch.*, October 17, 1911, p. 2,207) reviews the divers methods which have been used for the diagnosis of malignant growths by examination of the blood. Fuld and v. Dungern were unable to conform Kelling's statement that specific precipitins exist in the serum of cancer patients. At one time it was thought that cancer blood possessed hæmolytic action on the red corpuscles of the individual, i.e., isolysins, or of others, i.e., heterolysins; but the researches of many investigators have shown that when this peculiarity is found, it is in no sense specific. A similar behaviour may be noted in tubercle and other diseases. A rise in the antitryptic index occurs in any wasting disease, and is not limited to cancer. Ehrlich and others thought that the red blood corpuscles of cancer victims were more resistant than normal erythrocytes to the action of cobra venom, but this phenomenon may appear in syphilis, rabies, cholera, enteric, &c. Great things were hoped from Bordet's complement-fixation reaction. Though cancer serum will often deviate complement when a cancer extract is used as antigen, yet other sera—e.g., syphilitic—may also do this. Hence no reliance can be placed on the test.

The anaphylactic reaction has led to disappointing results. Freund and Kaminer claim to have shown that in the serum of cancerous individuals there is wanting a cell-destroying substance, which is present in healthy blood, and that indeed it contains a cell-preserving element. The experiments of later observers, however, indicate that the blood of pregnant women and of the new-born are alike deficient in these cell-destroying properties. Moreover, Simon and Thomas assert that cancer serum has a greater destructive effect on cancer cells than normal serum. Monakow has repeated these experiments and concludes that they are of no diagnostic value. Last of all is Ascoli's meiostagmin test. This depends on the combination of antigen and antibody lowering the surface tension of the mixture, which is expressed by the increase in the number of drops falling from a given measure. Ranzi has recorded a positive meiostagmin reaction in 89 per cent of 234 cases of malignant disease, while 233 controls were negative with three exceptions.

This test alone of all those mentioned above appears to be of importance in the diagnosis of malignant disease. C. B.

Lumbar Puncture in Uræmia.—Allaria (*Deutsch. med. Woch.*, November 2, 1911, p. 2,055) records a case of uræmia in scarlatinal nephritis, which was immediately relieved by evacuating 20 c.c. of cerebrospinal fluid by lumbar puncture.

C. B.

Drainage in Laparotomy.—Schlimpert (*Münch. med. Woch.*, October 31, 1911, p. 2,356) has used drains eight times only in 1,942 laparotomies, of which 72, or 3·7 per cent, died. Notwithstanding the closure of the wound in 115 cases of purulent peritonitis, no more than ten succumbed. Two deaths occurred among the eight patients in whom he employed drainage.

C. B.

Collargol in Military Surgery.—Hanasiewicz (*Militärarzt*, No. 23, 1911) discusses the value of collargol in military surgery. This drug was employed by v. Oettingen during the Russo-Japanese War, with the idea of preventing the development of micro-organisms in the infected wounds met with in warfare. For this purpose v. Oettingen had collargol made up into discs of 6 mm. thickness, each containing 0·05 grm.; these were carried in yellow glass bottles each holding 50 discs. A disc of collargol was placed on each wound before applying the "matrix" dressing. The results were most satisfactory.

Hanasiewicz decided to try the effect of collargol in septic cases treated by him in the civil hospital. He gives notes of twenty-five cases, which included such conditions as septic peritonitis, osteomyelitis, septic wounds, &c., which were treated with tabloids of collargol or irrigated with a 1 per cent solution. In all affections due to streptococci or staphylococci a very great improvement resulted. His conclusion is that collargol is a good and non-irritating antiseptic; being non-poisonous, in cases of septicæmia, it can be injected subcutaneously or intravenously, and exerts a powerful bactericidal effect.

C. E. P.

Examination of Recruits, &c.—Seyffarth ("Beitrag zur Verwertbarkeit des Pignetschen Verfahrens," *Deutsch. Militär. Zeit.*, November, 1911) describes the results he obtained by this method at this year's "Musterung" or preliminary examination of recruits. His figures were obtained from the following classes of recruits:—

(1) Men found fit.
(2) Men unfit on account of general under-development.
  (*a*) Likely to develop.
  (*b*) Fit for home service only.
  (*c*) Totally unfit.
(3) Men unfit on account of malformation of chest.
  (*a*) Fit for home service only.
  (*b*) Totally unfit.
(4) Men unfit on account of chronic disease of respiratory organs.
  (*a*) Fit for home service.
  (*b*) Totally unfit.

Of 1,721 men examined there were belonging to—

Class 1	859	= 49·92	per cent
Class 2*a*	466	= 27·09	,,
Classes 2*b* and *c*	34	= 1·98	,,
Classes 3 and 4	362	= 21·01	,,

Judged by Pignet's factor the results for Class 1 and Class 2A were as follows:—

Factor		Class 1		Class 2a
Less than 1	..	3 = 0·4 per cent	..	—
1—10	..	44 = 5·1 „	..	—
10—20	..	338 = 39·3 „	..	5 = 1·1 per cent
21—30	..	446 = 51·9 „	..	191 = 41·0 „
31—35	..	26 = 3 „	..	158 = 33·9 „
More than 35	..	2 = 0·23 „	..	112 = 24 „

It will be seen that the percentage belonging to the two middle groups is much the same in both classes, about half in either case, that of the remainder the majority in Class 1 belong to Pignet's higher groups, in Class 2a to his lower ones. It will be noticed also that the author passed as fit twenty-eight men whom Pignet would have called very weak or useless, and on the other hand five men whom Pignet would have passed failed to come up to standard. On the whole then Pignet's standard is slightly higher than that of the German Army.

Seyffarth then gives results of measurements of 2,728 serving soldiers. They are as follows:—

Factor			
Less than 1	..	..	30 = 1·1 per cent
1—10	..	..	406 = 14·9 „
10—20	..	..	1,522 27·1 „
21—30	..	..	740 = 27·1 „
31—35	..	..	28 = 1·03 „
More than 35	..	..	2 = 0·07 „

The contrast is sufficiently striking. The remainder of the article is taken up by some remarks on the relation of pulmonary disease to a high Pignet figure and of invaliding to the same.

J. A. B.

Death from Violence without External Marks of Injury.—Méd. Major Lévêque (*Archiv. de Méd. et Pharmacie milit.*, No. 12, 1911) reports an interesting case in which he was called on to determine the cause of death.

On January 25, 1907, the corpse of a young Arab was brought to the hospital at Gabès, Southern Tunisia. The man had left Gabès at 9 a.m. in company with three other Arabs; at 9.45 a.m. his dead body was found; his companions had disappeared. There were no signs of a struggle having taken place at the spot where the body was found, and his clothing was not torn or blood-stained. An autopsy was performed. There was no wound or bruise on the body, which was still warm. The examination was very thorough; special care was taken to examine the throat, chest and abdomen for any indication of violence which might have caused death, but none was found. The brain was normal. A dissection of the muscles of the neck was then carried out; in the neighbourhood of the occipital protuberance slight ecchymosis of the tissues was noted. The atlas was also found to be abnormally mobile from back to front and the occipito-atloid ligaments had been torn. The ligaments connecting the axis to the atlas and occipital were found to be extensively lacerated. The cruciform and transverse ligaments had been torn across. There was no fracture of any of the bones. The arches of the second to fifth cervical vertebræ were then removed.

The coverings of the spinal cord and medulla showed slight bruising. The structure of the medulla did not show any signs of injury.

It was found that by forcibly flexing the head the atlas moved with the occipital bone but the axis did not, hence the medulla oblongata was compressed by the odontoid process. By maintaining extreme flexion of the head the medulla was sufficiently compressed to inhibit the centres of respiration and circulation, without breaking up its structure.

The subsequent legal proceedings revealed the way in which the murder had been committed, viz.: When a short distance from the town the three Arabs seized their victim and threw him down; one man prevented him from rising while the other two violently rotated his head from side to side and then forced it into a position of extreme flexion when death quickly ensued. They then laid the body on its back and fled to their fields.

C. E. P.

Annual Report of the Württemberg Voluntary Aid Corps.—(*Der Deutsch. Kolonnenführer*, No. 24, 1911). The membership of this Corps now comprises 28 medical officers, 29 column and section commandants and 1,340 men, organized in twenty-five columns and four sections. All of these are fully trained and available for service.

In the event of mobilization this corps can provide 477 men for duty on the lines of communication. They are fully trained and clothed, and equipped with 299 stretchers, 335 surgical haversacks complete, 384 water-bottles and 295 lanterns.

The Corps also possesses the apparatus for fitting up 213 beds in temporary ambulance trains, as well as 24 wheeled stretchers, 6 horse-drawn ambulance wagons, 8 stores wagons, 44 panniers with dressings, 10 oxygen inhalation apparatus, 6 disinfection apparatus, 11 dressing tents and a large supply of prepared dressings and tools for improvisation work.

C. E. P.

Manostatic Capacity in Aviation.—Bonnier (*La Presse Méd.*, June 10, 1911), has found in the lower segment of the bulb manostatic centres whose function is to ensure the active maintenance of the equilibrium between our internal pressure and the variations of external pressure. The region of the bulb contains a great number of fibres derived from the roots of the trigeminal nerve fibres whose peripheral terminations in the nasal mucous membrane occupy the head of the inferior turbinated bone. In subjects whose arterial tension (which is the exciting agent of this manostatic equilibrium) is abnormal, a very slight cauterization of the nasal mucous membrane, at the spot referred to above, is enough to restore the arterial tension to normal. All aviators should be examined to ensure that their arterial tension or manostatic capacity is efficient, as otherwise they are unable to equilibrate their internal pressure with rapidly changing external pressures when rising or descending; if this takes place the aviator's faculties are dulled and an accident is likely to happen.

Epileptiform Attacks after Injections of Salvarsan.—Lesser (*Berlin klin. Woch.*, No. 13, 1912) reported two interesting cases. One was a powerful man, aged 44, who contracted syphilis in April, 1910, and

was treated with injections of salicylate of mercury. On July 30, 1910, signs of the disease were present and he received an intramuscular injection of 0·45 grm. of salvarsan. In August he received a second intramuscular injection of 0·6 grm. salvarsan; a month later as manifestations of the disease still persisted, he received an intravenous injection. Eight weeks after the third injection while playing cards he was suddenly seized with a violent epileptiform attack and sank unconscious to the ground; the condition lasted one and a half hours. A month later he received another intravenous injection which was not followed by any complication. Two further injections failed to produce any reaction.

The second case was a robust man, aged 39, who had contracted syphilis fifteen years previously, and had received two courses of mercurial injections. On account of the apparent onset of tabes he was ordered a combined course of mercury and salvarsan. After three injections of mercury he received an intravenous injection of 0·5 grm. of salvarsan dissolved in freshly distilled water; this was repeated a week later on November 16, 1911. There was no reaction in either case. On the night of November 19, 1911, the patient had a rigor with pains in his limbs and cramps in his calf muscles. On November 20, 1911, his condition suggested an attack of influenza. On the morning of November 21, 1911, he felt quite well, but was kept at home. In the evening while in bed he was suddenly seized with an epileptiform attack which lasted with intervals till 2 a.m. He died at 10 a.m. next day without having recovered consciousness. At the autopsy leptomeningitis was found but no gummatous condition.

C. E. P.

Fracture of the Sesamoid Bones of the Great Toe.—Stabsarzt Dr. Wolf (*Deutsch. Militärärzt. Zeit.*, No. 5, 1912) had charge of a soldier, who as a result of slipping on the barrack stair presented an extremely swollen and painful condition of the metatarsophalangeal joint of the great toe. Under treatment improvement was slow. An X-ray picture showed that the internal sesamoid bone was split into one large and three smaller pieces; a fracture of the bone was accordingly diagnosed. A second X-ray picture was taken fifteen days later. This showed no formation of callus or indeed any difference from the first picture. The diagnosis of fracture was therefore changed.

In consequence of the above case Wolf made an examination of all the Röntgen ray pictures of the foot taken, in the vertical direction, since 1902 in the military hospital at Leipzig. These numbered 900, and had mostly been taken to elucidate the cause of a swelling of the foot. In fifty-four of the pictures the sesamoid bone of one or both great toes was shown to consist of two or more pieces; in fifty-one of these the internal bone only was affected; fifty-one of the cases were infantry men. In most cases the clinical notes were scanty. Wolf concludes as a result of this examination that it is not uncommon for the sesamoid bones of the great toes to consist of several portions, and that fractures of the sesamoid bones are extremely rare. No case has been noted in the garrison of Leipzig during the last ten years.

C. E. P.

Antityphoid Vaccination in the Japanese Army.—Dr. Combe (*Le Caducée*, February 3, 1912) has published a short note on the results of

antityphoid vaccination in the Japanese Army. In the year 1909 27,772 men were vaccinated; the statistics of typhoid fever in that year were as follows:—

	Among the vaccinated	Non-vaccinated
Number of cases of typhoid fever	13 ..	294
,, deaths from typhoid fever	1 ..	49
Incidence of typhoid fever per 1,000 of strength ..	1·0 ..	14·52
Case mortality per cent in typhoid fever	7·0 ..	16·6
Average duration in days of fever per case ..	20 56 ..	22·52

The disease was much milder in vaccinated persons.

The vaccine was prepared from cultures of *B. typhosus* grown on agar. Each c.c. contained 2 mg. of dead bacilli.

At the first inoculation 1 c.c. of vaccine was injected.
,, second ,, 2 ,, ,, ,,

C. E. P.

Report of the United States Army Board for the Study of Tropical Diseases as they exist in the Philippine Islands.—By Major Weston P. Chamberlain, Medical Corps, U.S. Army, Captain Edward B. Vedder, Medical Corps, U.S. Army, and 1st Lieutenant John R. Barber, Medical Corps, U.S. Army, (Extract from *The Military Surgeon*, No. 3, March, 1912).

* * * *

Experiments with Headgear of Varying Colours.

"In the quarterly report of the board for September, 1910, details were given of some experiments which showed that uniforms of the new olive drab cotton material, and helmets covered with that material, were much warmer than similar articles of a khaki colour, the reason being that the darker shade of the olive drab cloth caused it to absorb a greater amount of solar heat rays. At the request of Colonel Hodgson, President of the Helmet Board, we have recently carried out some supplementary experiments, using a white helmet, a khaki helmet, an olive drab helmet, and a campaign hat. The method of conducting these experiments was similar to that described in the previous report and the details of the observation are given in the appended tables.

"It should be noted that the campaign hat furnished the Board was the kind which does not have the corrugated ventilating hat band and that the only aperture in it is a "star" of small holes punched in each side. If a campaign hat more freely ventilated were used the temperature in it would probably not range so high as those shown in the table, especially on a breezy day, but would probably always be higher than those in an olive drab helmet because the colour of the campaign hat is of a darker shade than the olive drab and consequently absorbs more heat.

"The tables bring out very clearly the same point emphasized in our previous report on the subject, viz., the great importance of colour in uniform materials. The helmets were exactly the same except for colour, and it will be seen from the averages in the table that the temperature was always much lower in the white helmet than in the khaki and considerably less in the khaki than in the olive drab. The campaign hat was a great deal hotter than the olive drab helmet.

"The later observations in each of the experiments (after the headgear had been exposed for at least fifteen minutes) bring out the difference

very strongly and demonstrate the great advantage, as regards coolness, of the white-covered helmet.

"The average for all the observations in all four experiments was as follows:—

Olive drab helmet		Khaki helmet		White helmet		Campaign hat.
40·42° C.	..	38·38° C.	..	35·36° C.	..	46·60° C.

"It will be noted that between the white helmet and the olive drab helmet there is a difference of more than 5° C., or 9° F. Another important fact is that inside the olive drab and the khaki helmets after a few minutes' exposure to the sun the temperature is always above the normal body temperature (37·0° C.) and, therefore, heat elimination is constantly required.

"Inside the white helmet the temperature never rose over 0·1° C. above body temperature, but was with one exception always below body temperature; and for all the observations averaged 2·16° C. (3·9° F.) below normal body temperature. Therefore, the white helmet did not add any burden of heat to the body.

"These experiments confirm us in the opinion expressed in our previous report that olive drab is not a suitable colour for either garments or headgear for garrison use in the Tropics.

"The general use of white garments as a uniform, however desirable it may be from heat reflection point of view, is for many reasons almost impracticable, and khaki of a shade not darker than our present issue is a very good substitute for white material. For helmets there seems to us to be no valid reason why white should not be used. A white helmet can easily be kept looking well by the use of blanco, and its appearance is not unattractive when combined with a uniform of khaki, olive drab, or any other colour. If it be planned to use a helmet in actual hostilities a khaki or olive drab dressing can be provided with which to promptly change the cover of the helmet from white to a less conspicuous colour.

"For the above reasons the Board strongly recommends that any helmet which is adopted be covered with white material in place of either khaki or olive drab."

* * * * *

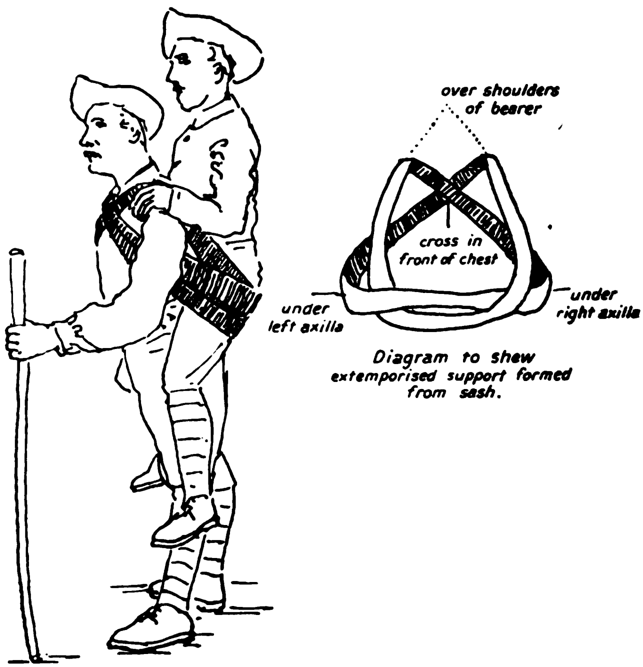
"The importance of considering the heat-absorbing quality of a uniform material is emphasized by the work reported at the recent meeting of the Philippine Islands Medical Association by Freer and Aron of the Bureau of Science. Their observations go to show that the injurious influences of tropical climates are probably due not to the short wave-length actinic or ultra-violet rays of the solar spectrum, but to the long wave-length heat rays."

• • • •

"These experiments were made solely for the purpose of determining the influence of colour on headgear and not with a view to advocating the adoption of a helmet for use in the Philippines. The Board at the present time is divided in opinion as to the desirability of the helmet for tropical wear, one member favouring it, one strongly opposing it and one being undecided."

Transport of Wounded in Mountain Warfare.—Méd.-Major Moureaux (*Archiv. Méd. Pharm. Milit.*, No. 1, 1912) describes the

following method of transporting wounded in mountain warfare by making use of the blue sash worn by Alpine troops. The middle of the sash is placed on the bearer's chest, one end is passed over one of his shoulders and the other end under his armpit on the opposite side. The wounded man is then placed pickaback on the bearer. The



two ends of the sash are next crossed under the patient's thighs, carried up under the bearer's free axilla and over his free shoulder, the two ends are then fastened together over the bearer's chest. It is claimed that a bearer can in this way carry a wounded man for three-quarters of an hour without suffering undue fatigue. The bearer's hands are also left free so that he can use a stick to aid him in descending a mountain.

H. E. R. J.

The Classification of Sick and Wounded in War.— Stabsarzt Dr. Reder (*Der Militärarzt*, No. 6, 1912) read a paper on this subject at the Military Surgeon's Society, Vienna, in which he laid stress on the following points:—

Sick.—The medical officer in charge of troops first sees the sick or wounded man and is responsible for his disposal. It is most important that this officer should not fail to recognize every case of infectious disease and have the patient isolated at the earliest possible moment. Other patients are seen again on arrival at the field medical unit, where any mistake in diagnosis would probably be corrected and no great harm ensue.

At the field medical units care must be exercised only to select such patients for evacuation as are not likely to be fit to return to duty within a reasonable time, as otherwise the means of transport and hospitals on the lines of communication must become overcrowded with men who ought to be at the front.

Wounded.—On arrival at a field ambulance a trained subordinate can easily pick out the men who require further medical assistance; medical officers should not be employed on this duty as their services are required to carry out the actual dressings and operations. On the other hand a medical officer must himself select the cases which are to be evacuated and allot them, according to their ability to bear the fatigue of the journey, to the different available means of transport. Only an experienced medical officer can gauge the effect of a journey on a wound. The entraining arrangements must be thoroughly thought out and a routine laid down to suit the particular circumstances, otherwise when crowds of wounded arrive at a station there is bound to be hopeless confusion. At Mukden, v. Oettingen classified the wounded into four groups, viz.: (*a*) Slightly wounded, not requiring hospital treatment; these were sent back to their unit. (*b*) Cases likely to require a long period for recovery; these were sent to what may be described as base hospitals. (*c*) Severe cases, requiring early hospital treatment; these were sent to the nearest lines of communication hospital. (*d*) Cases unfit for transport.

He also used a red label pasted on to the diagnosis tally to denote cases which should be transported in a permanent ambulance train. Dr. Reder criticized the use of a red label to denote a severe injury, as the patients soon learnt its significance and this exercised a very depressing influence on them. C. E. P.

Transport of Wounded in Hill Warfare.—*Das Rote Kreuz* (No. 2, Wien, March 16, 1912). At the meeting on December 15, 1911, of the "Bundesleitung" (central committee) of the Austrian Red Cross Society, Oberstabsarzt Dr. Steiner reported that the mountain transport carts supplied by the Red Cross Society had proved most successful during the disembarkation practices in Dalmatia. The D.D.M.S. of the 15th Army Corps also reported that the sick were most comfortably transported in these carts and that in spite of the severe test to which they were put there was no breakdown. The Austrian War Office considers the design of the carts to be quite satisfactory and has asked the Red Cross Society to provide a further supply.

C. E. P.

Notes from the Red Crescent Society at the Turkish Headquarters, Asisia, Tripoli.—*Das Rote Kreuz* (No. 2, March 16, 1912). At the outbreak of war the medical arrangements were most defective. On the arrival of the Red Crescent Society's expedition, the senior surgeon, Rerim Bey, who had studied medicine in Germany for several years, undertook the organization of the medical arrangements. The base hospital was located at Grigan, with lines of communication hospitals at Jiffren and Asisia. Only patients who are unfit to be moved or who require immediate operation are treated in the hospital at Asisia; the others are evacuated to Jiffren or Grigan. At Asisia a school house has

been converted into a hospital with accommodation for some twenty-five patients; a number of Arab houses have also been taken over for the sick. Nearly all the medical officers are volunteers. The Arabs do not, as a rule, present themselves for treatment until they have exhausted all local remedies, e.g., an Arab only applied for treatment after crawling about for thirty-five days with a double fracture of the femur. Anæsthetics are rarely required as the Arabs do not appear to feel pain and watch stolidly while they are being operated on. The Italian rifle bullet, as a rule, inflicts a trifling wound which speedily heals and permits the man to return to duty.

C. E. P.

Notes on the Military Medical Service of Turkey.—By Dr. Vollbrecht Bey, Lieutenant-Colonel in the Prussian Army Medical Service (*Deutsch. Militärärzt. Zeit.*, February 20, 1912). This officer was sent to Turkey to reorganize its army medical service; on arrival he found everything in a state of chaos. Previous attempts had been made to reorganize the service but these had ended in failure, one of the old Pashas deciding that "it is much simpler and cheaper to adhere to our former custom and let the wounded die." A depot medical company was in existence. In this unit men received theoretical instruction and detachments were drafted off to any required locality. This company has now been disbanded.

Shortly after his arrival, Vollbrecht was called on to organize the medical service for the manœuvres of 1910. There was no existing organization and the whole service had to be hurriedly created. He succeeded in raising two bearer companies in Constantinople and in providing field hospitals and rest stations for the treatment and evacuation of the sick. Fortunately, the Turk is a past master of improvisation, and hence all deficiencies were made good somehow. Although cholera appeared among the troops, the arrangements proved quite satisfactory.

The Turkish army medical service is based on the German model, but the number of medical officers is insufficient and there is no reserve, while the nature of the countries in which active operations are usually conducted precludes the employment of heavy vehicles or equipment. The administration is on the same lines as in the German army.

The sanitary officers at headquarters of the army will be provided with a microscope, a bacteriological case and a box of chemical reagents.

Each officer and soldier has a first field dressing consisting of a rolled bandage 5 metres long by 7 cm. broad; stitched to this is a compress with a second one attached by a thread. It is enclosed in waterproof wrappings. The compress is sterilized by steam and no antiseptic is employed. The dressings are prepared in the Government factory attached to the Army Medical School, Gulhane, under the direction of Professor Wieting Pasha.

Personal equipment.—(1) Every medical officer has a pocket instrument case, a case containing dressings and some drugs to be worn on the sword belt, and a block note-book for making reports.

(2) Each man of the medical corps carries dressings in two pouches on the belt for unmounted men (a single one on the saddle for mounted men), water-bottle with cup, and a shelter tent.

(3) Each stretcher-bearer has two pouches on his belt containing

first field dressings and triangular bandages, a water-bottle with cup and a shelter tent.

These three categories wear a white brassard with a red crescent.

(4) Each sick attendant has a red crescent stitched on to the left arm of his coat; he carries the same equipment as an infantry soldier, but instead of a bayonet he has a spade, saw or hatchet.

Each infantry regiment of three battalions has three battalion surgeons, three pharmacists, and three feldshers. No more feldshers are to be enrolled and their places will in future be filled by junior surgeons.

The subordinate medical *personnel* with a regiment is 12 men of the medical corps and 48 stretcher bearers. Musicians are employed as auxiliary stretcher-bearers.

The medical equipment of a regiment is:—

(1) With regimental headquarters, one infantry medical wagon. The contents are packed in cases adapted for pack transport, weight per animal 196 lb.

(2) With each battalion: 2 medical panniers containing medicines and dressings, 4 stretchers, 4 medical companions, 10 blankets, and 10 flannel belts. This equipment is carried on two pack animals. The drugs are mostly in tabloid form. The stretcher can be folded lengthwise and the canvas is removable. The medical wagon is to carry some tent poles to enable the shelter tents to be used for the accommodation of wounded.

At the battalion dressing station splints and dressings when necessary are to be applied and hæmorrhage controlled. At the regimental dressing station urgent operations are to be performed and plaster of Paris supports applied, and temporary accommodation provided.

The medical service with the cavalry is the same as in the German army.

The bearer company is modelled on the German one, but has only half the strength, viz.:—

Commandant	1 Captain from the train.	
Section Commanders	1 Lieutenant and 1 feldwebel.	
	2 Vice-feldwebels.	
	9 Under officers.	
	108 Bearers.	
	5 Men of the medical corps.	
	12 Sick attendants.	
	1 Cook.	
A detachment from the train for transport duties.		
	1 Senior surgeon.	
	4 Surgeons.	
Transport	4 Ambulance wagons (carrying 32 stretchers)	2 horsed.
	1 Medical wagon	2 horsed.
	1 Baggage ,, ...	2 horsed.
	1 Ration ,, ...	2 horsed.
	1 Field kitchen	1 horse.

There is also a dressing tent. Each wagon carries one or two water-tanks.

The bearers are taught to take every advantage of cover and to bring back the wounded man as soon as possible and not to waste time in trying to apply dressings.

Each army corps has six field hospitals, each accommodating 200 patients. Each field hospital has two tents for patients: each tent can shelter 25 patients. Shelter tents are to be used to complete the accommodation. Each field hospital can be divided into two mountain field hospitals, the equipment being carried on pack animals.

The mountain field hospitals are to form a double echelon, one half of them marching with the fighting troops, the other half with the supply columns.

On the Lines of Communication the medical service has been modelled on that of the German army. At present both *personnel* and *matériel* is deficient.

No. 6. June, 1912. Vol. XVIII.

J. J. Fotheringham

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL W. H. HORROCKS,

ROYAL ARMY MEDICAL CORPS

ASSISTED BY

MAJOR C. E. POLLOCK

ROYAL ARMY MEDICAL CORPS

ISSUED MONTHLY

IN ARDUIS FIDELIS

Printed and Published by

JOHN BALE, SONS & DANIELSSON, LTD.

OXFORD HOUSE,

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOLUME XVIII. JUNE, 1912. No. 6.

Journal

of the

Royal Army Medical Corps.

Original Communications.

THE PAPATACI FLIES (*PHLEBOTOMUS*) OF THE MALTESE ISLANDS.[1]

By R. NEWSTEAD, M.Sc., A.L.S., &c.

ACTING under the instructions of the Liverpool School of Tropical Medicine, I proceeded to Malta on June 25, 1910, and stayed in the island for a period of two months. The object of this expedition was to investigate the problems connected with the menace to health caused by the blood-sucking "papataci flies" of the genus *Phlebotomus*.[2] The greater part of my time was devoted to searching for the breeding-places of these insects with a view to devising practical prophylactic measures for the control of the pest. Other phases relating chiefly to the bionomics of *Phlebotomus* were also investigated; and attempts were made to rear the insect from the egg.

On making a critical examination of the material collected during the first week of my visit, two distinct species (*P. papatasii*, Scop., and *P. perniciosus*, n. sp.) were found to be almost equally abundant; and examples of a third, though apparently rare, species (*P. minutus*, Rond.) were subsequently taken. Since my return to England, Captain P. J. Marett, R.A.M.C., has very generously placed the whole of his collection of Maltese papataci flies in my hands for examination and report; and among the numerous

[1] Reprinted from the *Bulletin of Entomological Research*, vol. ii, by kind permission of the Scientific Secretary.

[2] These insects are generally known to Englishmen as "sand-flies."

examples there were two specimens which have proved to be a new and hitherto undescribed species (*P. nigerrimus*, n. sp.), so that altogether four distinct species of *Phlebotomus* are now known to occur in the Maltese Islands.

These discoveries, though of much interest for the zoologist, add considerably to the labours of those who are or may be engaged in studying these insects more especially from a medical point of view; as owing to the minute morphological differences which exist between the females of these small midges the task of separating the respective species, more especially the commoner ones, is one which can be accomplished only after long and careful microscopical examination and comparison.

Hitherto the only species recorded from Malta was the common and widely distributed *P. papatasii;* but judging from recent experience, I have come to the conclusion that the almost equally abundant *P. perniciosus* must have been seen, though not recognized, by those who have been engaged in studying the bionomics of these insects.

It is highly probable, too, that examples of this species were also used by those who conducted the transmission experiments, and although one has no direct proof, it is possible that *P. perniciosus*, like its near relative (*P. papatasii*), may also act as a carrier of papataci fever.

THE SEARCH FOR BREEDING-PLACES OF PHLEBOTOMUS.

The results of my unremitting search for the breeding-places of these insects were that I secured two larvæ from the crevices of the loose rock in the "caves" or catacombs at Notabile near the centre of Malta; thereby confirming the discoveries made by Captain Marett [6][1] a month or so previously. Had my researches been continued in the same kind of habitat, I have reason to believe that a few more larvæ would have been secured, but having trained the eye so as to facilitate the finding of so minute an object the more readily on any future occasion, I proceeded in other directions, and searched innumerable places that were thought likely to form suitable breeding-grounds for these insects, unfortunately without discovering either eggs, larvæ or pupæ; disappointment met me at every turn, and I am therefore unable to add anything that is new or noteworthy regarding the breeding-places of *P. papatasii* or any of the allied species.

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[1] Such numbers refer to the bibliography.

In addition to the cave from which larvæ were secured, I also inspected the places in which both larvæ and pupæ had been found by Captain Marett; these were the cave at Gozo, the embankment forming part of the Cottonera Lines, and the stone wall in Captain Marett's garden, which he had thoroughly explored and had also kept under close and constant observation for a considerable time. In all of these places the conditions were very similar, if not almost identical.

In the caves the larvæ occurred in the crevices and fissures beneath the loose rock amongst the damp earth, &c., at some distance from the surface, and I was informed that those which were found in the stone wall occurred low down near the foundations, well within the centre, and attached chiefly to the under surface of the stones; while those from the Cottonera embankment were found at some considerable distance from the surface, where the stones were damp. [6]

The crevices between the loose rock in the caves were often found partly filled with soil rich in organic remains. In the caves at Notabile, in which the larvæ were found, the soil had for the most part been reconstituted by the burrowing larvæ of various insects and other allied animals. To such an extent had this been done in some instances that quite 50 per cent. of the deposit consisted of the rejectamenta of insects, woodlice (*Oniscus* sp.), &c. Here and there were found also large numbers of the empty pupæ of *Stomoxys calcitrans* and the pupæ of other Muscid flies, whose larvæ had matured in the stable refuse which had been stored in the cave for agricultural purposes.

In all of these places the conditions were practically the same, the three main factors being: (*a*) the presence of organic matter; (*b*) moisture, but not in excess; and (*c*) the absence of light.

The principal places which were searched as being likely to afford suitable breeding-grounds for Papataci flies were as follows: The main sewers and ventilating shafts in various parts of the city of Valetta; drains of various kinds, cesspools and latrines in many places; cellars and prison cells in the police court; sewage works, and the dark, damp buildings used by the Customs as bonded stores; refuse of all kinds, especially such as occurred in dark, damp places; the refuse "tips," and the roots of plants along the coast, especially in localities which were known to be badly infested with the flies; the decayed stems of the prickly pear (*Opuntia* sp.); collections of stone and rock in shady places in gardens and elsewhere; freshly excavated earth and rock; the empty shells of

molluscs (chiefly *Helix* sp.) found in caves and other sheltered situations; refuse in caves which were used as stables for oxen and other domesticated animals, and the fæcal matter which was found in those which had been used as latrines; the roots of trees, ivy, and flowering plants, which were kept moistened by constant supplies of water, also those growing in the rock fissures; the accumulation of leaves in damp places, &c.; litter from rabbit-hutches, consisting chiefly of fæcal matter, especially at Casa Leoni, where the adult flies were invariably found associated with these animals.

Although one failed to discover either larvæ or pupæ in any of these situations, it does not prove conclusively, in my opinion, that these insects do not breed in some of them, especially as Grassi [3] has found that in Italy the larvæ of *P. papatasii* live in dark, damp spots amidst all kinds of refuse in underground places such as cellars, and particularly on the sides of drains which are kept moist by occasional splashes of dirty water.

Other investigators in Malta have met with results similar to my own. Lieutenant-Colonel C. Birt, R.A.M.C., [2] who collected the most varied materials, states that he did not succeed in detecting the ova or larvæ in any of the samples, "nor has the adult *P. papatasii* ever hatched out from larvæ which might have been hidden in the materials." Captain Marett [6] has also made extensive search for the larvæ and pupæ in similar places and in similar materials, and has failed to find a single example of the insect in any of its stages. In so far therefore as our present knowledge is concerned, the only conclusion which can be drawn from the investigations in Malta is that the chief breeding-places of the papataci flies (*P. papatasii* and *P. perniciosus*) are the crevices between the loose rocks in caves, stone walls, bastions, and similar situations.

The task of finding such minute objects as either the larvæ or pupæ of these flies is, however, very great; of the two, the larvæ are perhaps the more conspicuous, but these have the remarkable habit of flicking themselves from off the surface of the stone or other objects when exposed to light, and in this way numbers may escape detection even under the most practised eye. The pupæ are the more difficult to detect, as, apart from their minute size, the colour so exactly harmonizes with the colour of the rock to which they are attached that they are rendered almost invisible, and when detected appear only as a naturally formed granular projection on the surface of the stone. In every sense, therefore, they are highly

protective forms, and numbers must necessarily escape detection, more especially when artificial light has to be employed in searching for them. Bearing these facts in mind, large quantities of detritus were collected from many and varied sources, so that it could be examined under more favourable conditions, but in no single instance were these insects found in either of their preliminary stages, though a lens of low magnification was almost invariably employed in searching for them. Quantities of the detritus were also kept in large vessels in the hope that adult flies might be successfully reared from it; in this, again, complete failure was the result. As to the detection of the ova in a state of nature, I believe this to be a practical impossibility, as when laid upon dark substances they become absolutely invisible, and can be detected only by the aid of a microscope. Even when laid in captivity in confined areas they are most difficult to detect, and under the most favourable conditions can be seen only when laid upon colourless or transparent surfaces, such as white paper or the surface of a glass tube.

HABITS AND OCCURRENCE OF THE ADULT FLIES.

Though so evasive in their early stages, the adult flies may be found almost everywhere throughout the island in favourable situations or localities. They outnumber the mosquitoes, and the females may be included among the most vicious of all the blood-sucking arthropods. They are distinctly "domestic" in their habits, and may be considered among the most detestable of all man's "uninvited guests." It is a curious fact, however, that they have their likes and dislikes both in regard to hosts and habitats. I can, fortunately, place myself among the small numbers of those who have proved immune to the bites of these blood-sucking pests; or at least I have never consciously experienced the effect of their bites, any more than I have in the case of *Pulex irritans*. And this is all the more extraordinary because fresh comers to the island, especially children, generally suffer torture from the bites of these insects, and many cases are admitted to the hospitals through the infection which the papataci flies are known to convey. To say the least, they are an intolerable nuisance in every part of the world in which they are known to occur. Man is evidently not the only vertebrate which these insects attack, as examples were frequently found which had filled themselves to repletion with the blood of the domesticated rabbit; so that it is evident that they are not entirely dependent upon man for food, and the probabilities are

that they subsist and flourish on any of the warm-blooded animals when man is not available.

My experience with regard to the favoured haunts of these flies is almost precisely the same as that of other investigators. In certain parts of the island they were found to be abundant, while in others, for some unaccountable reason, they occurred very sparingly, though the conditions necessary for breeding purposes, especially stone walls, abounded everywhere. In badly infested regions, too, they favoured certain dwellings much more than others; of two houses occupying the same aspect and surroundings, or a section of the same block or street, one was often found to be infested while the other was rarely visited. It was noted also that there was a marked domiciliary distribution in many houses. Bedrooms on the first floor, especially those occupying a position on the lee or sheltered side of the house, were particularly favoured, while those on the opposite side of the building were rarely visited; and rooms at a greater elevation (second floor), which I had under close observation for a considerable time, were only once found to contain a single example.

The naval and military camps at Ghain-Tuffeiha afforded also a remarkable instance of the local distribution of these flies, the naval camp on one side of the plain being badly infested, while the other and more extensive camp was said to be practically free from the invasion of *Phlebotomus*. This remarkable localization was in all probability due to the fact that the naval camp was bounded on one side by rocky ground and stone walls, affording excellent breeding-grounds for the flies, while the military camp was remote from such surroundings, and lying fully exposed in the open plain.

At times also, when papataci flies were literally swarming in houses near the old bastion at Floriana, not a single individual was discoverable in the city of Valetta, half a mile away. In this instance also one may safely infer that the flies at Floriana were breeding in close proximity, and it is highly probable that the actual site was in the interstices between the masonry forming the old fortifications, only a few yards distant from the dwellings.

The daylight retreats of these flies were often similar to those in which they were found at night, providing always that there was an absence of direct light. Thus in the dwelling-houses and barracks the flies were found at rest in the dark corners of the rooms, under garments, behind pictures, and in other similar places; but in nearly all cases they occurred in considerably smaller numbers

than at night, though there were one or two noted exceptions. In one instance they could be found in considerable numbers in a badly lighted bedroom at any time of the day, especially after a still, damp night with a heavy sirocco. Odd examples were also found in cellars and in the prison cells in the heart of Valetta; while numbers could be found almost at any time in the small caves or isolated catacombs at Notabile, and such retreats seemed to be one of their favourite haunts during the day. In the early mornings, shortly after daylight, examples of both sexes may frequently be found inside the mosquito curtains, and after favourable nights they sometimes get entrapped in large numbers by this means. On the slightest disturbance the males may readily effect their escape through the meshes of the net; but the females, which are generally engorged with blood, are, under such conditions, much more sluggish than at other times and may then be captured with comparative ease, as they cannot escape through the net very readily when the body is distended with food. In one or two instances papataci flies were dislodged from the interior of stone walls by forcing tobacco smoke into the interstices; but one met with such little success that this method was abandoned. Sections of the lower portions of stone walls were also covered with chiffon and carefully examined at intervals during the night, and although the most favourable structures were selected for the purpose, and areas 36 square feet in extent were most carefully covered, not a single fly was entrapped by this method. This is all the more strange seeing that Captain Marett has met with marked success by adopting the plan, even on a smaller scale. However this may be, it is perfectly obvious that in the light of Captain Marett's experience stone walls, especially those from which the surface "pointing" has fallen away in patches, leaving free access to the interior, are the frequent, and possibly the principal, resorts of the parent flies.

Atmospheric conditions have, undoubtedly, a marked effect upon the flies. On still sirocco nights they take wing freely, and occur in dwellings in larger numbers under such conditions than at any other time. On the other hand, when fresh cool breezes are blowing, especially from the north-west, they are rarely seen; and it is the testimony of everyone who has studied their habits that these insects remain in their hidden and sheltered retreats, and rarely venture forth at such times. There is little wonder at this, as their frail bodies and delicate wings are ill-suited for flights under such conditions; moreover, it is a habit common to many members of

the same order; minute midges, in particular, are often seen to swarm on still, warm evenings, and rarely, if ever, assemble in numbers under any other circumstances.

A general belief is held by the Maltese that certain kinds of trees and shrubs (fig and loquat especially) form the principal resorts of these insects, and many are also under the impression that they breed either in the foliage or branches, or in the fallen and dead leaves which lie beneath them. There may, of course, be a measure of truth in these theories; but we may at once dismiss the statement that they breed in the trees. It is perfectly obvious, however, that the presence of ornamental shrubs and fruit trees in the walled-in gardens would afford them just the kind of shelter and shade which they require, and would enable them in all probability to travel the more safely from their breeding-places to the house in the immediate vicinity. It is just possible that rotting vegetation in damp, shady places, such as shrubberies, may form a breeding-place also, but so far as our researches have extended up to the present moment we have no evidence in support of this view. Considerable attention was paid to searching such materials, but with negative results, as has already been stated. It is clearly evident, moreover, that dry materials, whether in a state of decay or otherwise, do not form a suitable breeding-place, especially dead leaves which may accumulate on the surface of the ground beneath the trees; light and dryness being both unsuitable conditions for the preliminary stages of the *Phlebotomus*.

The characteristic attitude of *Phlebotomus* is portrayed on Plates II and III. When at rest the wings slightly diverge, and are elevated at a considerable angle above the thorax and abdomen. On the least disturbance the insects make short, rapid flights, almost invariably to the right or left, reminding one of the rapid movements of a flea rather than those of a winged insect. Occasionally, however, they will take long-continued flights, when the course is more or less direct and distinctly midge-like. Their movements on the wing can be followed with little difficulty in daylight, but by artificial light it is almost impossible to do so for more than a few seconds at a time.

Both sexes live but a short time in captivity, unless they are fed upon human blood. Without this they will subsist on wet blotting-paper or other damp materials, such as soil, fresh leaves, &c. Under such conditions many examples survived for periods varying from three to nine days, though the majority died on the third and fourth days, even although the females, in many instances,

had taken a meal of blood a few hours before they were captured.

SEASONAL PREVALENCE.

The adult insects were more or less prevalent during the whole of my stay in the island (July, August, and the first week in September). That the numbers fluctuated during this period has already been mentioned, but this was apparently due, in a large measure at least, to variations in temperature, humidity, and wind. Relatively few papataci flies occur before the middle of June, and practically all observers of their habits informed me that they occur most freely and are most troublesome during the hot, dry months of the year. It is highly probable that successive broods are produced during the summer months, but as the larval stage occupies apparently a long period, the successive generations can be produced only at extended intervals.

As to whether the larvæ occur most frequently during the summer remains to be seen. It is my impression, however, that they may be found more abundantly in autumn and winter than at any other season, and careful search should be made for them a week or so after the adults have disappeared.

PROPHYLACTIC MEASURES.

In consideration of the facts which have so far been brought to light regarding the economy of *Phlebotomus*, it is clearly evident that the task of suppressing these insects is an almost insurmountable one. Had we to deal with insects as large and as accessible as mosquitoes, the adoption of prophylactic measures would be comparatively easy, but owing to the extremely minute size, and almost flea-like habits of the adult insects, and the enormous area over which the breeding-places may occur, we are faced with a problem which is most difficult of solution.

As I was unable to devote any time to experimental work bearing upon the control of these pests, the only course open to me now is to suggest a few measures which may ameliorate the existing conditions, and lead to a reduction of the malady of which these insects are transmitting agents. It seems to me, however, that the only practical way of grappling with this question is to proceed tentatively at first, and although I have discussed an extensive field of operations which may be directed against these insects, I would pin my faith rather to some of those measures which are considered under the following headings. But in the first instance it must be borne in mind that precautions against the bites of

blood-sucking insects, though feasible to intelligent and well-to-do persons, are not, as a rule, employed by the mass of the people. Yet any prophylactic measures which are calculated to diminish the infection, even in a small degree, should be seriously and persistently employed.

Repellents.—I had no opportunity of demonstrating the value of these by experiment owing to my immunity from the bites of these insects, but I was assured that several good formulæ were in general use, though proprietary preparations were rarely employed. Judging by the testimony of those who had used such deterrents, one of the best was that which was prescribed by Major Crawford, R.A.M.C., and I am extremely indebted to him for giving me permission to embody it in this report. It is composed of the following ingredients :—

Ol. anisi	ʒ i.
Ol. eucalypti	ʒ i.
Ol. terebinth.	ʒ ss.
Ung. acid. borac.	℥ i.

Spraying with Repellents.—The least objectionable of these, and at the same time one of the most effective, is formalin. The dark portions and angles of sleeping apartments should be sprayed with a 1 per cent solution of this substance every day during the season in which the flies are prevalent: a fine spraying apparatus is necessary for its application, and an excessive amount must not be applied. It is considered an excellent plan also to spray the mosquito curtains regularly every day towards sunset; nets thus treated are claimed to repel the attacks of these insects.

Fumigation.—There are several substances which are employed as fumigants for the destruction of insects, but I fail to see the practical utility of employing such means for the destruction of papataci flies in Malta or elsewhere.

Light.—Daylight is a most important factor in driving away these insects from man's dwelling-places, and directly a flood of light is admitted to a room in which papataci flies may be present, they immediately seek places of concealment behind garments or draperies and pictures, or other furniture which may be suspended from the walls or placed in dark corners. It is important, therefore, that as much light should be admitted into the rooms as is possible, and this can easily be done either in the early morning or evening, or when the windows are lying in shadow.

Beds should be arranged in the best lighted portions of the room, and on no account should children's cots be placed in out-

of-the-way corners in deep shadow. Decorative drapery in such apartments should be abolished, and the walls rendered as free from pictures and other furniture as possible.

Artificial light does not, unfortunately, act as a repellent; on the contrary, it would appear to serve as an attraction for these insects, as it is well known to do with other groups belonging to widely different orders.

Artificial Air Movement.—In India, if not also in other parts of the Tropics, it is a recognized fact that punkahs and fans will repel the attacks of mosquitoes if continuously and properly employed. It seems to me, therefore, that if a similar method could be applied in Malta we should be able to dispense with almost every other form of prophylaxis which is discussed in this report. As it has been abundantly proved that papataci flies do not take wing when the slightest breezes are blowing, one may safely infer that they would not face a strong current of air such as would be produced by either fans or punkahs. It is unlikely that the latter will ever be employed in Malta, but it is my firm belief that if electric fans were fitted so as to produce a current of air in the direction of the window in sleeping apartments, very few, if any, of the flies would be able to pass through the open window into the room beyond. I venture to recommend, therefore, that this method be put to the test, and if found to give satisfactory results, that it be employed in all cases where the cost of running such an apparatus is not a serious consideration.

Traps.—If a modified form of the biscuit-box trap, such as is used for capturing mosquitoes, were fixed high up in the dark corners and angles of the rooms, I believe that numbers of papataci flies would be entrapped. The trap should be made in the form of a corner cupboard in miniature, and should measure about 18 in. in length; the basal portion should be left open, and the interior should be lined with dark cloth or similar material. These should be examined daily and the flies killed with ammonia fumes.

Nets.—The use of ordinary mosquito nets is of no avail against the bites of these pests, as they readily pass through the meshes, and attack persons just as freely as if nets were not used; but if they could be rendered repulsive to the insects by spraying them with formol or other repellents, as has been suggested, so much the better; but experiments in this direction must be conducted before we can say definitely that such a method would prove effectual. Fine nets made of strong chiffon or other similar material would, undoubtedly, prevent the approach of these flies, but the use of

such nets would render sleeping almost impossible in the hot weather unless electric fans were used at the same time. If such preventive measures as these could be employed to the complete satisfaction and comfort of patients in hospitals, especially those suffering from the papataci fever, or to the community in general, we shall have succeeded in devising an excellent prophylactic measure. If a net of this type is used, it should have a strip of calico about $2\frac{1}{2}$ ft. in width, stitched all round the bottom, so that at least 12 in. of it extends above the bedding, the remainder to be tucked in under the mattress. The use of this is obvious; the strip above the bedding would prevent the flies from biting any portion of the body which might be brought into contact with it, and the lower portion of it would stand the strain of "tucking-in," and, consequently, last for a very much longer time than such flimsy material as chiffon.

Destruction of Breeding-ground.—As to the operations necessary for reducing the number of breeding-places, it is perfectly obvious that we can never expect to be able to deal with these in any of the rural districts, owing to the fact that the fields and roads extending over the whole of the country are bounded by stone walls, and elsewhere there are fissured rocks, caves, and other suitable places which afford just the right conditions necessary for the breeding of papataci flies. On the other hand, we may reasonably hope to reduce them in the principal centres of population, if persistent efforts are made to accomplish this, and if financial considerations do not prohibit the employment of such methods as are herein suggested. If it should be considered advisable to carry out any section of this part of the propaganda, one of the smallest and most isolated of the infested areas should be chosen as an experimental ground, and an officer who is thoroughly acquainted with the habits of the insects should be appointed to direct the operations. If loose rubble walls exist in the immediate neighbourhood of the selected area, these should be either demolished and the materials removed, or they should be completely covered with a thick layer of cement.

If such a type of wall exists as has the jointings partly filled with plaster ("pozzolani") then all openings and fissures should be carefully filled in with cement, so that no holes are left for the ingress or egress of the flies, remembering always that a crevice sufficiently large to admit a flea will also afford ample space for the admission of the fly.

If it should be found necessary to replace the old walls with

new ones, it is imperative that these should be built of solid masonry to a height of at least 2 ft. above the level of the soil on either side, as it is the lower portions of the walls that are, according to Captain Marett's experience, selected as breeding-places; but it would be better, in my opinion, to make all new walls of solid masonry from the foundation to the topmost course or layer; and if the old walls could be substituted by any other form of boundary so much the better.

There are also other kinds of walls which may have to be dealt with, and these are they which form the old bastions and other extensive fortifications at Cottonera and elsewhere. In cases where such structures are backed with rubble and finally protected with loose rock, it would be a comparatively easy task to prevent the egress of the flies through such loose material by breaking or pulverizing it, or by covering it with soil; but, unfortunately, the question of pointing the ashlar work forming the facings of the bastions and curtains presents not only a serious financial difficulty, but a task which could be accomplished only by a huge army of men; and in consideration of these facts it seems to me that in the present stage of our inquiry such a method of procedure would be extremely unwise and irrational. For the time being, therefore, I should strongly advise that in selecting the experimental area a site should be chosen which is as remote from the old fortifications or similar structures as is possible.

Though there is no evidence which will lead us to believe that papataci flies breed in the cellars and drains in Malta, at the same time we must not lose sight of the fact that Grassi, [3] as has already been stated, has found larvæ of *P. papatasii* in such places. It is highly probable, therefore, that this species breeds in similar habitats in Malta also; but it is impossible without more study to make any definite statement on the point. Taking all the facts into consideration, therefore, I consider that the only really practical prophylactic measures which can at present be taken are those which are considered as precautionary against the bites of these insects. It is perfectly obvious, moreover, that any operations which will not bring about an almost complete destruction of the breeding-grounds are not likely to make an appreciable reduction in the numbers of these insects.

(*To be continued.*)

NOTE ON THE BACTERIOLOGICAL EXAMINATION OF INDIAN WATER SUPPLIES.

By Major R. W. CLEMENTS.
Royal Army Medical Corps.

As the Sanitary Officer of the 9th (Secunderabad) Division, I have, since November, 1910, attempted to make definite bacteriological examinations of water samples within the command. These examinations have been based mainly on the instructions contained in Memorandum No. 4,555, drawn up by the Sanitary Officer at Army headquarters, and issued by the Principal Medical Officer, His Majesty's Forces in India, under date of September 21, 1910.[1] The results of these examinations are kept in a special book as a reference for the formulation of possible local standards. As it would involve too much space and expense to print in detail the report on each particular water sample examined, the main results of twenty-nine samples have been summarized in the accompanying table. It is notable to be able to record that on no occasion was a *Bacillus coli* of Escherich isolated from a drinking-water supply in this division. It will be admitted by most that this is a remarkable fact, and emphasizes clearly not only the need to examine critically Indian water samples bacteriologically, but also the necessity of revising accepted European standards.

It may be stated at the outset that the form of report adopted has been that drawn up by Major Clemesha, I.M.S., and published in his report on the bacteriology of drinking-water supplies in tropical climates.[2] Further, the classification of organisms isolated has been made on Clemesha's lines, or according to their power of resistance to sunlight, and the verdict as to recent or remote contamination with fæcal micro-organisms based on the class to which the micro-organisms isolated belong.

In view of the fact that the majority of water supplies in the 9th Division are wells or large tanks or ponds, and that storage in either form is known to have a powerful effect in reducing the number of bacteria present, it is not surprising that this factor, together with the action of sunlight in tropical climates, should

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[1] Republished in the Journal of the Royal Army Medical Corps, November, 1910.

[2] Published by Government of India as Appendix I to "Annual Report of Kin Institute, Madras," 1908.

contribute largely to the purification of water in India, provided always that the supplies and storage reservoirs are properly protected. Heavy rains interfere with storage, and in addition we have the risk of surface contamination in both wells and tanks to consider. The possibility of fæcal material from both men and animals gaining access to the water under conditions of heavy rainfall is obvious.

The question of possible surface pollution of water supplies during heavy rain has been much neglected in India, and it is only slowly that faulty conditions are being remedied. Some wells in this division are now properly steined, covered in and provided with a pump to preclude the risks associated with the primitive and too prevalent system of hand haulage. By attention to this point several supplies, which were reported during 1910 as being dangerous or suspicious, have in 1911 been readily passed as safe. Another prevalent source of danger to our wells is the failure to guard carefully the adjacent area. A well drains an area of ground roughly about four times its own depth—more in a porous soil—and great care is required to see that this area is kept clean. To illustrate this, the water from a well in the officers' mess compound at St. Thomas' Mount has frequently been condemned as unfit for drinking. I inspected the well and found it surrounded by a small garden and flower-pots; it was at once evident that the source of contamination was manure from the garden and flower-pots. In most cases where wells yield contaminated water, this is due to faulty construction, and especially as regards steining. For example, if a well is 30 ft. deep, the sides for at least 20 ft. should be imperviously steined with bricks or stones, and lined with hydraulic cement. If this is done, water percolating from the surface must pass through at least 20 ft. of soil before entering the well, and in its passage through the soil, if the surroundings are protected, a large amount of organic impurity will be removed. As another example of imperfect steining the following may be quoted: depth of well 22 ft., the top 6 ft. steined with brick and mortar, and the lower 16 ft. with brick and mud. Such a well is liable to surface contamination unless the surroundings are carefully looked after. In this Division, Madras, St. Thomas' Mount, Poonamallee, Bellary, Calicut, Cannanore, and Mallapuram derive their water supply from wells, and in the event of any further improvements being carried out in connexion with these wells it is necessary that the question of steining with hydraulic cement be considered and adopted. The excellent diagram in Notter and

Firth's "Theory and Practice of Hygiene," third edition, 1908, p. 45, might well be taken as a guide for this kind of work by our military and public works engineers.

As a corollary to this question of the bacterial contents of Indian waters, much work has been devoted in our divisional laboratory to the study of the bacterial flora resulting in a water when contaminated with the excreta of various animals. The results are given below. They are both interesting and instructive, as throwing a side-light on the nature of the micro-organisms we so constantly find in Indian water supplies :—

(1) One gramme of cow dung rubbed up with half a litre of tap water. Of ten micro-organisms isolated, five were *Bacillus grünthal*, one Clemesha's No. 7, one *B. coli mutabilis*, and three *B. vesiculosus*. All belong to the class most resistant to sunlight, or Clemesha's Class III.

(2) As above, but water allowed to stand a day. All the micro-organisms isolated were *B. vesiculosus*.

(3) One gramme of rabbit dung rubbed up with half a litre of tap water. Six colonies were *B. grünthal*, and four were Clemesha's No. 106.

(4) Similar to above, but kept at room temperature for a week. Result of ten colonies isolated showed four *B. grünthal*, five No. 106, and one *B. neapolitanus*.

(5) As in four, but kept for a fortnight. Result showed, of ten isolated colonies, four to be *B. neapolitanus*, five No. 106, and one No. 71.

(6) As above, but after standing three weeks. All the colonies were either Clemesha's No. 71 or No. 106; that is, belonging to Class II, or those intermediate in their power of survival.

(7) One gramme of chicken droppings rubbed up with half a litre of tap water. Of ten colonies isolated, one was *B. coli communis*, seven were *B. grünthal*, and one each of Nos. 1 and 71.

(8) As above, but kept for a week. One was *B. coli*, one *B. neapolitanus*, one *B. grünthal*, one *B. coscoroba*, one No. 66, three No. 1, one No. 7, and one No. 71.

(9) As above, but kept for two weeks. Result: three *B. grünthal*, three No. 1, and one each of Nos. 7, 71, 74, and *B. coscoroba*.

(10) As above, but kept for three weeks. Result: of ten colonies isolated five were No. 106, two No. 1, two *B. grünthal*, and one No. 7.

(11) As above, but kept for a month. All the colonies isolated were those of Clemesha's No. 7.

(12) One gramme of horse dung rubbed up with half a litre of tap water. Result gave five of No. 1, two of *B. grünthal*, and one each of *B. coli*, No. 71, and No. 106.

(13) As above, but kept for a week. Result: of ten colonies taken four were No. 1, two No. 102, one *B. coli*, one *B. grünthal*, one No. 71 and one No. 106.

(14) Same as above, but kept for two weeks. Of ten colonies taken, three were *B. coli*, three No. 71, two No. 1, one *B. grünthal* and one No. 109.

(15) One gramme of dog's fæces rubbed up with half a litre of tap water. Result: of ten colonies six were *B. grünthal*, two *B. coli*, one No. 1 and one No. 36.

(16) As above, but kept for a week. Of ten colonies taken, four were *B. coli*, four *B. grnthal*, and two No. 106.

Note by Colonel R. H. Firth.

The foregoing came through my hands as part of the Annual Report of the Sanitary Officer of the 9th Division. As the writer of Memorandum No. 4,555 referred to, the subject matter naturally appealed to me, and in view of its general interest I am responsible for sending it to our Journal. I am also responsible for the particular form in which the tabular statement has been presented. In their original form the tables submitted by Major Clements did not lend themselves readily for publication.

That such an inquiry as this has been systematically attempted in the 9th Division is particularly encouraging, but it is matter for regret that other Divisional Sanitary Officers have not been able to initiate for their own areas an inquiry on similar lines. We have available, from Clemesha's work, valuable information as to the bacterial flora of Madras waters generally, and this record by Clements is confirmative of the published facts. It is evident that in the waters of Southern India, certain groups of lactose fractors are dominant. What we want to know is, how far the same groups and species are present in the ordinary water supplies of other districts, more especially in the Punjab, the United Provinces, and the western parts of India. The bacteriological examination of drinking waters is notoriously difficult even in Europe; the difficulties and fallacies associated with such work in India are infinitely greater. Under these circumstances, we need to be cautious how we interpret the results; but we shall never be any nearer the attainment of a position in or from which we can speak

Source of the sample	Date of examination	Total micro-organisms on agar at 37° per c.c.	Minimum volume in c.c. in which fæcal lactose fractors were present	Lactose fractors isolated and identified by subculture from ten selected colonies	Remarks
Secunderabad pipe supply (Jitmulla tank)	1. 6.11	580	0·1	*B. coscoroba* only	All Class II .. Safe.
Secunderabad pipe supply (Gun Rock wells)	20.11.11	Uncountable	0·1	*B. grünthal* (8), *B. coscoroba* (1), *B.* No. 73 (1)	Class II and III .. Safe.
Secunderabad pipe supply (Jitmulla tank)	21.11.11	Uncountable	0·1	*B. neapolitanus* only	Class II .. .. Safe.
Ditto (drawn from stand-pipe in R.A. lines)	3.12.11	60	25·0	*B. coscoroba* only	Class II .. .. Safe.
Secunderabad pipe supply (stand-pipe in 7th D.G. lines)	3.12.11	Uncountable	40·0	*B. cloacæ* only	Class III .. .. Safe.
Bangalore (after sedimentation but before filtration)	27.11.11	90	5·0	*B. lactis aerogenes* (6), *B. coscoroba* (2), *B. cloacæ* (1), and *B. grünthal* (1)	Class II and III .. Safe.
Ditto	26.10.11	110	25·0	*B. coscoroba* (5), *B. grünthal* (2), *B. cloacæ* (1), *B. lactis aerogenes* (1), *B. neapolitanus* (1)	Class II and III .. Safe.
Bellary. Artesian well	1.4.11	500	1·0	*B. grünthal* (5), *B. coscoroba* (4), *B. lactis aerogenes* (1)	Class II and III .. Safe.
Bellary. No. 1 well	17.7.11	850	0·1	*B. coscoroba* (8), *B. grünthal* (1), *B. neapolitanus* (1)	Class II and III .. Safe.
Bellary. Artesian well	27.7.11	740	0·1	*B. lactis aerogenes* (5), *B. cloacæ* (4), *B. neapolitanus* (1)	Class II and III .. Safe.
Bellary. No. 1 well	29.11.11	370	1·0	*B. cloacæ* (7), *B. neapolitanus* (1), *B.* No. 100 (2)	Class II and III .. Safe.
Wellington. Laboratory tap	4.3.11	460	5·0	*B. acidi lactici* (8), *B. cloacæ* (2) ..	Class II and III .. Safe.
Ditto	4.12.11	30	5·0	*B. grünthal* (4), *B. cloacæ* (6) ..	Class III .. .. Safe.

St. Thomas' Mount. Well in officers' mess compound	24.4.11	1,400	0·1	*B. lactis aerogenes* (7), *B.* No. 67 (3)	Class III	Safe.
St. Thomas' Mount. Well No. 16 ..	24.4.11	6,400	0·1	*B.* No. 105 (5), *B.* No. 97 (1), *B.* No. 98 (1), *B.* No. 99 (2), and *B. gasoformans non-liquefaciens*	Class I and II ..	Doubtful.
St. Thomas' Mount. Well in B.I. lines	24.4.11	1,300	0·1	*B. oxytocus perniciosus* (1), *B. rhinoscleroma* (3), *B. cloacæ* (4), *B. acidi lactici* (1), *B.* No. 105 (1)	Class I, II, and III	Doubtful.
St. Thomas' Mount. Well in N.I. lines	3.11.11	3,310	0·1	*B. cloacæ* (4), *B.* No. 6 (4), *B. neapolitanus* (2)	Class II and III ..	Safe.
St. Thomas' Mount. Well in R.A. lines	3.11.11	7,170	0·1	*B. lactis aerogenes* (7), *B. coscoroba* (2), *B.* No. 67 (1)	All Class II ..	Safe.
St. Thomas' Mount. Well in mess ..	3.11.11	3,160	0·1	*B. coli mutabilis* (3), *B.* No. 36 (4), *B.* No. 67 (2), *B. lactis aerogenes* (1)	Class I, II, and III	Doubtful.
Poonamallee. Well No. 16	15. 6.11	1,650	1·0	*B. grünthal only*	Class III	Safe.
Poonamallee. Well No. 13	15. 6.11	1,690	0·1	*B. neapolitanus* (5), *B. cloacæ* (4), *B.* No. 100 (1)	Class II and III ..	Safe.
Poonamallee. Well No. 13	14.11.11	890	0·1	*B. lactis aerogenes* only	Class II	Safe.
Poonamallee. Well No. 10	14.11.11	Uncountable	0·1	*B. coscoroba* (4), *B. grünthal* (3), *B.* No. 1 (3)	Class II and III ..	Safe.
Cannanore. Well No. 44 B	16. 3 11	430	25·0	All *B.* No. 109	Class III	Safe.
Cannanore. Well No. 47 D	7. 6.11	380	5·0	*B. grünthal* (8), *B. coli mutabilis* (2)	Class I and III ..	Doubtful.
Cannanore. Well No. 44 B	4.11.11	2,170	5·0	*B.* No. 109 (8), *B.* No. 1 (1), *B. lactis aerogenes* (1)	Class II and III ..	Safe.
Cannanore. Well No. 47 D	4.11.11	760	1·0	All *B. lactis aerogenes*	Class II	Safe.
Trichinopoli pipe supply	3. 1.10	360	5·0	*B. vesiculosus* (8), *B. coli mutabilis* (1), *B. coscoroba* (1)	Class II and III ..	Safe.
Ditto	14.10.10	6,220	10·0	*B. coscoroba* (7), *B.* No. 106 (2), *B.* No. 114 (1)	Class II	Safe.

with confidence, until more facts, and covering a greater area, are obtained and published. It is for the appreciation of this aspect of the question that I appeal.

Further experience, and the discussion of this matter with practical workers, leads me to doubt whether the presence or absence of lactose fractors only in an arbitrary volume of water, constitutes the best or more practical criterion by which we, in India, can attempt to appraise the quality of any particular sample which comes under examination. Everything points to the fact that in India lactose fractors are present in very small volumes of water which, from epidemiological and everyday experience, are undoubtedly safe waters, or at least waters incapable of causing disease usually associated with a fæcal origin. The total count per c.c. on agar is an equally doubtful datum, unless made always at once on collection of the sample. Too frequently, this is impossible to carry out. If this be so, it is obvious that we run great risks of condemning waters on unsound data, with every chance of bringing the whole procedure of water bacteriological examinations into disrepute. The pressing need, apart from reliable data, is for a reasonably simple and rapid technique or procedure, by which a busy man can form a reasonably sound opinion as to danger or safety in the case of samples submitted. We must not forget that there are times when men receive as many as from twenty to forty samples of water for examination within a few days. What is a Sanitary Officer to do under such circumstances? I was present, recently, at such a sequence of events. Each sample was put through the lactose fractor reaction, and five-sevenths of the samples, on suggested standards, fell into the condemned category. The situation was ludicrous. A personal visit to eight out of ten of the sources from which the incriminated samples had been taken showed that the local conditions pertaining both as to the place and health of the users of the waters warranted no condemnation. The question is, what can we do towards arriving at a sound working procedure, likely to give us the best and safest results. I confess I hardly know.

To meet the needs of routine work and of the busy man confronted with many samples, I suggest the following tentative procedure: Prepare and keep four stock solutions, each marked respectively as LA, SA, AA, and DA. These stock solutions to have each and all the common composition of peptone 60 grm., sodium taurocholate 15 grm. to one litre of water, with 10 c.c. of a 5 per cent solution of neutral red added, and the whole standardized

to the neutral point. The one marked LA must in addition contain 15 grm. of lactose, the one marked SA must contain 15 grm. of saccharose, the one marked AA must contain 15 grm. of adonit, and the one marked DA must contain 15 grm. of dulcit. Take twelve test tubes, each containing a fermentation tube, and in three of these place 5 c.c. of stock LA, in three place 5 c.c. of stock SA, in three place 5 c.c. of stock AA, and in three place 5 c.c. of the stock DA. Mark each set carefully, and to each of the three tubes in each set add respectively 5 c.c., 1 c.c. and 0·1 c.c. of the water under examination. Incubate for twenty-four hours at 42° C. or for thirty-six hours at 37° C. If all the series show acid and gas it is practically certain the water is contaminated by fæcal bacilli. If two out of three of each set show acid and gas, there is strong presumptive evidence of fouling. The critical information is to be drawn from the fermentation reaction in the respective three sets containing saccharose, adonit and dulcit. Thus, assuming we get a positive fermentation reaction in all these three and in the lactose or LA as well, the inference is justifiable that the water contains bacilli associated with recent fouling, or those which are of low resisting power. The type of this group of bacilli is the *Oxytocus perniciosus.* If there is fermentation in LA and DA only, it is probable that subculturing will show the pollution to be mainly by *B. coli communis.* If fermentation is evident only in LA and SA, the water probably is of the reasonably safe type and containing either *B. coscoroba* or *B. cloacæ*, or both. If there is marked fermentation only in LA and less marked in SA and AA and none in DA, the probabilities point to *B. lactis aerogenes* as a dominant micro-organism and the water as fairly safe. If there is only marked fermentation in LA and little or none in either SA, AA and DA, the presumption is that *B. grünthal* is the dominant organism and the water reasonably safe. The critical fermentation is that in DA, and when positive is indicative of the presence of objectionable bacteria, probably *B. oxytocus perniciosus* or *B. coli*, or even both. If the former, then there will be associated fermentation in the three other sugars, while if *B. coli*, then the results will probably show negative fermentation in SA and AA. This latter sequence of results is associated with other micro-organisms than the *B. coli*, and differentiation can only be made by subculturing. But, broadly speaking, this grouping of the fermentations is suggestive of an objectionable type of lactose fractors.

An alternative method to the above would be to omit lactose altogether in the preparation of the stock solutions and substitute

inulin. These, using the corresponding symbols, would be marked SA, AA, DA and IA. Then, following the same routine, we have a series of possible combinations of wider range, and offering a surer basis on which to formulate a definite opinion or interpretation. Assuming we use four series of culture broths containing respectively saccharose, adonit, dulcit and inulin on the plan indicated, then a positive fermentation in all four is a definite suggestion that *B. oxytocus perniciosus* is present. If fermentation is present only in SA, AA and DA, the probable micro-organisms present are Clemesha's types Nos. 66, 67 and 68, the latter being an intermediate in resistance to survival, and the other two unclassified. If fermentation is given only in SA and DA, the probabilities are we are dealing with more or less innocuous types like Nos. 71, 72, 73, 74 and 75. Positive result only in SA suggests *B. coscoroba* and *B. cloacæ*, and possibly presence of unclassified types, such as Nos. 106 and 109. Failure to get fermentation in any of the four series would suggest presence of one or other only of Nos. 4, 5, 6, 7 and 8. Of these No. 4 is *B. grünthal* and No. 6 alone, a doubtfully resistant micro-organism. If fermentation is found only in IA, the presence of *B. levans* and No. 10 is suggested. Given fermentation in SA, AA and IA, we get evidence of sensitive types like Nos. 98 and 99, and a resistant type like No. 97. Similarly, positive results in DA and AA suggest intermediate resistant forms like Nos. 33 and 38. Where DA alone gives a positive result, the presumption favours the presence of objectionable types like *B. coli* and *B. schäfferi*. Positive results only in SA and IA indicate only resistant and presumably harmless varieties of micro-organisms. A heavy pollution by intermediate forms such as *B. lactis aerogenes* and Nos. 100, 101, 102 and 104 are suggested by fermentation only in SA and AA. On the other hand, fermentation only in DA and IA suggests nothing more serious than No. 39, which is unnamed, though of probable recent fæcal origin. *B. acidi lactici* is probably the dominant micro-organism where fermentation is confined only to AA. Given fermentation only in SA, DA and IA, we might suspect Nos. 69 and 70, both unnamed fæcal types but incapable of long survival in water.

Summarizing, the fermentation combinations suggestive of bad or suspicious waters on this rough evidence would be positive results in SA, AA, DA and IA, positive in only SA, AA and IA, positive only in SA, DA and IA, positive only in DA, and IA and a positive only in IA, or a positive only in DA. Of these, the most important and suggestive of definite condemnation are the first and last com-

binations, that is either fermentation in all four of the series or fermentation confined to DA only. The combination of fermentation only in DA and IA is suspicious; the others less so as we do not know yet the degree of danger attaching to such unclassified forms as Nos. 3, 37, 97, 102, 105 and 110 as tabulated by Clemesha. The volume of water from which the various combinations are obtained will naturally influence the interpretation in all cases. In Indian waters, the most important micro-organisms as indicative of recent pollution are *B. oxytocus* and *B. coli* followed closely by *B. schäfferi.* The first named gives a characteristic fermentation combination ; *B. coli* is motile, and *B. schäfferi* is non-motile.

Of course, these are only rough-and-ready procedures and put forward tentatively. For final identification there must be further subculturing, plating and critical examination on well-known lines. These proposed methods are suggested solely as possibly likely to meet the needs of quick work. They are capable of development and improvement. They are advanced here in no spirit of finality or dogmatism, but merely as a possible way out of a difficult situation at this present time, when our knowledge as to the bacterial content of Indian waters is so scanty. Their advancement here must not be interpreted as justifying the abandonment of more elaborate procedures. If we are ever going to acquire complete knowledge of the bacterial contents of Indian or other waters, the examinations must be on orthodox lines and involve subculturing with registration of all the subsidiary reactions. The practical difficulty is the cost of adonit, dulcit and inulin. We are sanguine of overcoming this, as the financial state of all our laboratories in India is likely to improve steadily, and, moreover, we are assured that the Store depots will be able soon to supply these sugars at a reasonable rate, and at prices less prohibitive than those quoted for the small or casual purchaser in the open market.

MUSHROOMS—THEIR IDENTIFICATION AND EFFECTS.

By Colonel R. H. FIRTH.
Royal Army Medical Corps.

Cases of mushroom poisoning are not common in civil practice; they are still less so in military life. An incident which came under my notice recently has prompted me to inquire into this question, more particularly as concerns Indian mushrooms.

This note, though primarily relating to India, may not be without practical interest to others serving at home or elsewhere, as most of the varieties of the Agaricaceæ, about to be referred to, are common in Europe. Travelling by train from Dehra Dun, at a small wayside station a young civil official entered my carriage. This was about half-past eight in the evening. My fellow-traveller had been out for a week's shoot, and joined the train at the out-of-the-way station referred to. We settled down for the night. Between ten and eleven o'clock I was disturbed by my companion, who said he was very ill, and thought he had cholera. He undoubtedly seemed very ill; had vomiting and diarrhœa, said he felt giddy and faint, and generally presented the signs of a person on the verge of collapse. A rapid scrutiny of the case suggested that my friend was not suffering from cholera, but rather from some form of food poisoning. Inquiry elicited the fact that both at his morning and evening meal that day he had eaten mushrooms, numbers of which he had come across while wandering about. Beyond this fact there was nothing to suggest that any special article of his recent dietary was the cause of the attack from which he was suffering. Situated as we were in a railway carriage alone, and remote from any large civil or military station, it was obvious that remedial measures must necessarily be of the simplest and most empirical. Personally, I had nothing with me which could be used as a remedy. Fortunately, the sick man had a basket with him containing some food and condiments. Among these, I found half a bottle of whisky and some salt. To meet the more urgent syncopal symptoms he was dosed liberally with the whisky, and made to remain on his back. Gradually the more urgent symptoms passed off; he was then made to swallow a tumblerful of strong salt water; severe vomiting following, with some return of the collapse. Further administration of alcohol and the recum-

bent posture caused a gradual improvement. Concurrent with this a sufficiency of mustard was available from his food store to permit of the making of rough mustard plasters spread on some newspaper. One such mustard plaster was placed over his heart, and one over the pit of his stomach. Gradually the acute symptoms passed off, the patient dropped off into a doze, and by four in the morning was sufficiently better to cause no anxiety either to himself or to me.

Now this is a sort of case which might occur to any of us, and had some features which suggested a more serious result than actually occurred. To me its main interest centred in the cause. Putting all the facts together, the assumption was justifiable that it was a case of ordinary poisoning by mushrooms. The patient was convinced that mushrooms were the cause. Unfortunately he had none left in his food basket for purposes of identification, and, as a non-observant layman, was quite unable to give any intelligent descriptions of the mushrooms which he gathered. A talk with his servant who had cooked them threw little or no light on the question of identity; the only remark one could get from him was that they were "mokshai," and very good things to eat and really a medicine. Subsequent inquiry as to the meaning of the term "mokshai" indicates it to be a native expression covering the whole mushroom family, and possibly some fungi, too, which, when dried, are in popular demand as an hepatic stimulant. Apart from this crude information, I have been unable to learn anything as to common Indian mushrooms, and, to make matters worse, the literature available bearing on the subject has been equally scanty.

To fill these gaps in knowledge I have, with some trouble, obtained a few samples of mushrooms to be found in Indian markets, and the following notes concerning them may perhaps be of use to others. The inquiry has been not uninteresting from another point of view, as it has brought out the appalling ignorance and prejudice which exists among both Indians and Europeans as to these common articles of food. The prevalent ideas as to how to detect a harmful kind are in some cases distinctly amusing. Thus, a lady, who is an experienced housewife, laid great stress on the fact that a hurtful mushroom always clotted milk. It is needless to say that the test is absolutely unreliable. The same informant told me that if one placed a piece of silver in the pot in which they were being cooked, if any hurtful variety were present the silver would be blackened. In spite of my demonstrating to her that

Amanita citrina, which is a notoriously poisonous variety, failed to blacken silver in the process of cooking, she remains convinced as to the accuracy of her original statement. Among Indians a prevalent belief is that the poisonous varieties of mushroom are never attacked by worms or insects. This is not true, as both *A. muscaria* and *A. citrina* are constantly attacked by snails and slugs. Not a few people trust to the reaction of a change in colour when one breaks a toxic variety across. This is no sure test, as *A. pan-*

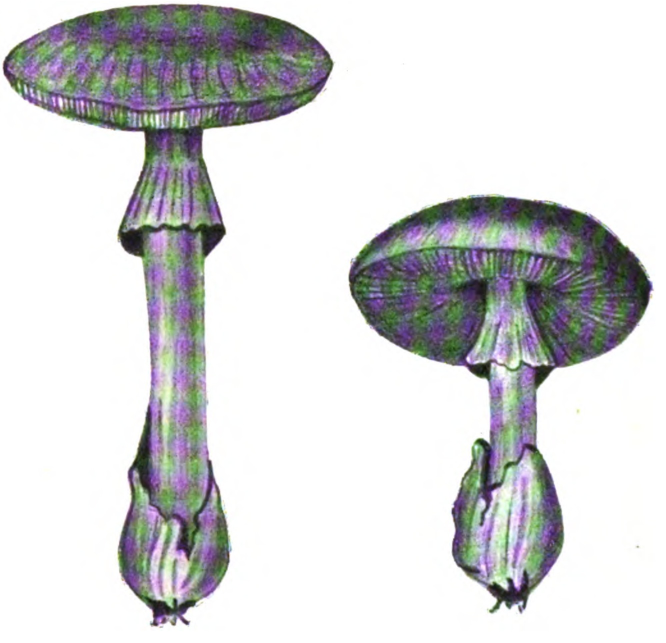

FIG. 1.

therina, which is a poisonous species, remains perfectly white at the place or surface of fracture. On the other hand, well-known edible varieties change colour, such as *A. rubescens*, which turns a rose-pink, *Lactarius deliciosus* turns a pale green, and *Boletus scaber* turns a pale blue on fracture. Equally misleading is the notion that if one puts a peeled onion into the cooking pot a blue or brown discoloration of the onion indicates a poisonous variety. I might extend this list of empirical tests indefinitely, one and all having no basis of truth in them. So far as I can learn, there

is no reliable rough-and-ready means of detecting the edible mushrooms from the non-edible. Probably, the only sound way of rendering a poisonous mushroom safe is to submit it to prolonged boiling or to prolonged maceration in salt water. So treated, many poisonous species can be eaten with impunity, but the procedure renders them tasteless and removes the essential taste and bouquet which render mushrooms so popular.

The majority of cases of mushroom poisoning, at least in India, and not unlikely, too, in Europe, appear to be due to certain species or varieties belonging to the two main families of the Agaricaceæ and Polyporaceæ.

FIG. 2.

The Agaricaceæ are mushrooms which present a stalk or stem surmounted by a cap or head, on the under surface of which are a number of radiating plates or lamellæ. When young, mushrooms are enclosed in a kind of membranous case; this splits, dries, and falls off, but often one finds remains of this original sheath round the foot of an adult form. Frequently, at the upper part of the stem there is found a membranous collar, arranged like a partly folded umbrella. Between the folds or lamellæ are concealed the spores in form of a fine dust of variable tint. Of those having white spore-dust, the Amanita group is particularly rich in poisonous varieties, the most prominent member being the *A. phalloides* (fig. 1). This mushroom is the cause, probably, of nine out of ten cases of poisoning, owing to its resemblance to ***Russula** virescens* (fig. 2), which is harmless and most edible. Differentiation lies in the fact that *A. phalloides* retains more or

less vestiges of its primordial membranous case and has a well-marked collar-ring; on the other hand, the Russula has neither vestiges of a primitive envelope nor the collar. Specimens of both these varieties have come under my notice in India, also several of another poisonous variety, namely, *A. citrina,* which is not only toxic, but very liable to be mistaken for the most common mushroom of all, namely, the *Psalliota campestris,* which is quite innocuous. This latter has brown or rose-coloured folds or lamellæ

FIG. 3.

FIG. 4.

and a brown spore-powder, while *A. citrina* has white lamellæ and white spores, and usually definite remains of its primordial case or envelope.

Another not uncommon poisonous variety to be found in India and in Europe is *A. muscaria* (fig. 3). This is liable to be mistaken for an absolutely harmless kind, the *A. cæsarea,* which is said to be the most delicately flavoured of all the mushrooms; it

is said also to be common in India, but only one specimen has been obtained (fig. 4). Its distinguishing feature appears to be the presence of a golden-yellow colour at the bases of the folds or lamellæ and on the collar-ring. In the specimen obtained this golden-yellow was certainly well marked. In *A. muscaria* these same parts are said to be always white; in two specimens examined the colour was better described as a pale straw. Another point of distinction between the two is the presence of remains of the primordial envelope in *A. cæsarea* and its absence in *A. muscaria*, or at least but slight remains. In the examples of both which have come under notice this characteristic was clear, but, considering

Fig. 5.

Fig. 6.

the rough handling which mushrooms undergo, it is questionable whether much reliance should be placed upon the presence or absence of this casing or remains of it as a criterion of non-toxicity or toxicity.

Several other poisonous varieties are to be met with in India, notably *A. pantherina* and *A. verna*. Only a damaged specimen of the former has come under personal notice. Both should be rejected readily, owing to their disagreeable odour in the fresh state. There are also a few varieties with rose-coloured spore-powder which are very toxic. Fortunately they are uncommon.

None has come under inspection. One variety, known as *Volvaria speciosa*, is liable to be mistaken for *Psalliota campestris*, but usually the existence of remains of the primordial casing, the absence of a collar-ring, and its disagreeable odour should suffice to reject it.

Although the greater number of poisonous mushrooms belong to the Amanitæ, there are some objectionable types among the Lactarii and the Russulæ. Thus, although *Lactarius deliciosus* is a common edible (fig. 5), its near relations, such as *L. piperatus*, *L. rufus* and *L. pyrogalus*, are definitely toxic. No examples of these have been found in India, or at least no specimens have been brought to me. Similarly, among the Russulæ we have two fairly common edible varieties in *R. virescens* and *R. aurata*. It is doubtful whether the latter is to be found in India. Toxic members of the same group are *R. fœteus* and *R. nigricus*.

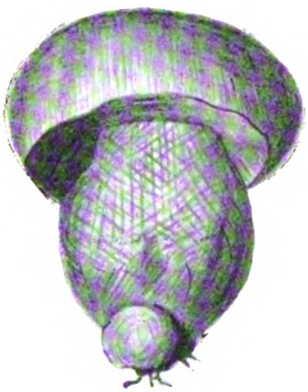

FIG. 7.

FIG. 8.

Among the Polyporaceæ is the species Boletus, which contains a common edible variety known as *B. edulis* (fig. 6), and a highly toxic variety known as *B. satanas* (fig. 7). Both are to be met with in India. The latter is to be distinguished by the bronzed grey of its head, its squat shape, and the red colouring at its foot. Though a poisonous variety, its effects are not usually fatal. As several specimens of *B. satanas* were sent me from the Dun it is not unlikely that the symptoms experienced by my travelling companion were really caused by this particular variety.

Besides the particular kinds of mushroom already mentioned,

there are others which occasionally produce untoward effects. These bad results follow only the consumption of the mushroom in the fresh state, the reason being that the toxic agent is helvellic acid. This acts by its high hæmolytic power, but being very volatile rapidly disappears on drying and during cooking. The most dangerous member of this group is probably *Gyromitra esculenta* (fig. 8). It is closely allied to *Helvella esculenta* from which helvellic acid was originally extracted. Probably, a number of this group are to be found in India, but only *G. esculenta* has come under notice. They are readily recognized, being small mushrooms with a short stem and having round or irregularly shaped heads of a dark brown colour, often black, and marked by dentations which remind one of cerebral convolutions. As a group the Helvellæ and Gyromitræ are not attractive to look at, and their generally repulsive aspect should suggest rejection. It must not be assumed that all the Helvellæ are noxious. On the contrary, *H. lacunosa* and *H. crispa* are quite edible. They are to be recognized by their small fleshy heads, often contorted, and their comparatively short stems, which are often marked by cavities or hollows.

If we inquire as to the nature of the toxic agent present in mushrooms we find that our knowledge on the point is still imperfect. Broadly speaking, the poison belongs to one or other of two groups. One group includes a series of alkaloids such as choline, neurine, betaine and muscarine. This latter is especially present in *A. muscaria*, from which it was first isolated by Koppe and Schmiedeberg in 1870. It is highly toxic, as little as 0·05 mg. arresting a frog's heart in diastole. Cats are killed by a dose of from 2 to 3 mg. In man, the lethal dose is 5 mg., the antecedent symptoms being free sweating, salivation, tetanic or cramp-like muscular contractions, retention or rather suppression of urine, papillary paresis and cardiac failure.

The other group of toxic bodies to be found in certain mushrooms is not an alkaloid series, but embraces certain protein substances, such as phalline, recovered in 1890 by Robert from *A. phalloides*. Phalline is highly hæmolytic, thermostabile and very soluble in water. This explains why mushrooms which owe their toxicity to phalline are not rendered non-toxic by boiling.

The symptoms following mushroom ingestion vary according as to whether the toxic agents be muscarine or phalline. Under the muscarine group come mushrooms like *A. muscaria* and *A. pantherina*. The symptoms develop rapidly, that is from within one

to four hours. They are cramp-like pains at the pit of the stomach, vomiting, diarrhœa. There is free perspiration and later suppression of urine. In fatal cases, death results usually in forty-eight hours, the patient lapsing into coma. Fortunately, the poison appears to be eliminated fairly rapidly and unless the ingestion has been excessive, recovery is the rule rather than the exception. The picture is quite different when the toxin belongs to the phalline group, as after ingestion of *A. phalloides*, *A. citrina*, *A. verna*, and *Volvaria speciosa*. In these cases, the onset of symptoms is delayed from twelve to thirty hours and insidious. The patient has rigors, cold sweats, is obviously ill and anxious. Gradually stupor comes on, the urine is suppressed and the skin becomes jaundiced. Later paretic symptoms supervene and death results from syncope. These cases are extremely severe and often a fatal result has followed the eating of a single mushroom. As might be expected, the very young and very old are much more sensitive to mushroom poisoning than adults of middle age. The symptoms are often delayed by sleep and it is not infrequent to meet with cases when the symptoms should have come on some three hours after food, and be delayed owing to a heavy slumber until the next day. Other disturbing factors in the sequence of events are the manner of cooking and the amount ingested. The nature and mode of onset of symptoms will often afford an index as to the variety of mushroom ingested. Subsidiary information on the point may be gained by a microscopic examination of the vomit and stools, where the presence of mycelian debris and of spores will permit of a well-informed observer indicating or recognizing the peccant variety. The same facts will be of importance from a prognostic point. Poisoning by mushrooms of the muscarine group will be of less probable gravity than poisoning by mushrooms of the phalline group. In the one the violent and explosive nature of the symptoms appeal for an active interference, while, in the other, the insidiousness of the onset, the long incubation and the masked nature of the intoxication, all contribute to a delay of therapeutic measures until too late.

This brings us to the question, what measures will first avail in cases of poisoning by mushroom? It is doubtful whether emetics are indicated. They are useless in muscarine intoxication, as the stomach has already evacuated its contents, while in phalline intoxication the poison has had so long a start that it has left the stomach and is already being absorbed from the intestines. Emetics are hurtful, moreover, in that they exaggerate the pains and exhaustion of the sick person. If any measures are to be taken

to evacuate the stomach in these cases, probably the best procedure to adopt is free lavage by means of a two-way tube. Purgatives, on the other hand, are always indicated in these cases, the salines and castor oil being probably the best. Much relief can be given by sedative plasters and even by counter-irritation. The action of the kidneys must be encouraged above all things. To this end, the sick person should be encouraged to drink freely of barley-water and milk. If the symptoms indicate syncope and collapse, dry friction of body and limbs, hot bottles, mustard plasters, and administration of stimulants such as tea, coffee, alcohol, and even ether obviously suggest themselves. We still are in need of a specific remedy by which to combat these intoxications. Treatment must of necessity be symptomatic and to some extent empirical: but to be of any use at all it is necessary for it to be prompt. In probably no class of cases is the element of time of greater dominance.

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PRACTICAL HINTS ON MARCHING AND HEALTH ON ACTIVE SERVICE.

By G. FAHEY.

Late 88th Connaught Rangers.

(*Continued from page* 543.)

PART VI.

HEALTH AND INDIVIDUAL SANITATION ON ACTIVE SERVICE.

In all our modern campaigns, the proportion of deaths from disease has invariably been far greater than that of the killed and died of wounds.

It is hardly necessary to quote figures to maintain this assertion, the fact is but too well known. One has only to read the inscriptions on any of the numerous war memorials that have been a feature of the South African War, to be convinced in the most striking manner of the truth of my assertion.

After the list of the killed or died of wounds received in action appear the names of the men who died of disease during the course of the war, and the latter are usually twice to three times as numerous as the former.

That this deplorable condition of affairs is not an absolute necessity, and is to a certain extent preventable, has been proved by the experience of the Japanese troops in Manchuria.

All the efforts, however, of the medical department to combat the ravages of disease, may count for nothing if the individual soldier is careless, or ignorant of the methods of keeping himself in health, and of minimizing the dangers of contracting disease whilst on active service.

When it is recognized that the chance of death or injury by the enemy's missiles is about one-third less than that by the ravages of disease, one would have thought that the soldier would have been more concerned about his chance of surviving the latter than the former.

It is not so, however, for no matter how concerned the individual soldier may be about his chances of coming through an impending encounter with the enemy, he is seldom troubled with any anxiety about his chances of falling a victim to the ravages of the far greater and more exacting enemy—disease.

The disease that claims the greatest number of victims during a campaign is, undoubtedly, enteric fever. It is the greatest scourge to modern armies in the field, and the disease against whose ravages the main efforts of all medical departments have been directed.

When the troops were leaving for South Africa, numbers of men underwent, voluntarily, the process of inoculation against enteric or typhoid fever. It was not claimed at the time to be a certain preventative against the fever; it was then only in the experimental stages, for its efficiency had never been tested.

The campaign offered a splendid opportunity to carry out this test; but so imperfect were the arrangements that no reliable statistics were prepared, nor accounts kept, of the numbers of men affected by the disease who had been inoculated, and of those who had not undergone the process.

Personally, I had some faith in inoculation and was one of the first to submit to it, nor has my subsequent experience shaken my faith in the treatment.

Being somewhat interested in the subject, I took a note of the men I knew who contracted enteric fever during the campaign, and noted whether they had been inoculated or not, with a view of arriving at a conclusion of my own on its merits. Very few of those who had been inoculated that I knew of were attacked with the fever at all, and those who were had it in a less severe form than usual, and recovered more rapidly.

Any man who was inoculated successfully would feel the effects of it for at least five days. It usually left him in a weak and feverish condition for that period before he recovered his normal condition. I should, therefore, advise any soldier to submit to the inoculation before leaving for a campaign, or for any country where enteric fever is usually prevalent.

No ill-effects are likely to follow from it, as it only causes a temporary disarrangement of the system and is likely to be of great service. The experiment is well worth trying. It should not, however, be thought that inoculation is likely to effect such complete immunity from enteric fever that no other precaution need be taken to guard against the chances of contracting the disease.

Whilst it is generally admitted that impure water is the chief cause of enteric fever, it is surprising how little care is taken by the authorities to insure that the drinking water, both in camps and on service, is purified.

The only effective way of treating water so as to destroy any

germs of disease that it may contain, is to boil it. The filter only clears it of dirt or sand, but does not render it free from germs, yet how few appliances are provided for boiling water on service, or even in camps, or on manœuvres at home.

Then take the regimental water-carts. How seldom, if ever, are these thoroughly cleaned out and disinfected. Impure water may be carried in them to-day, whilst to-morrow perfectly pure water may be polluted by the dregs of the previous day's impurities. It is no use putting pure water into a water-cart impregnated with the germs of water drawn from, perhaps, hundreds of different sources. The water-cart should, whenever possible, be thoroughly cleaned and disinfected before any fresh water is taken into it, especially when the water is taken from a different source daily, as it is when on the march.

As with the regimental water-cart so it is with the men's water-bottles. In fact, I think I can venture to say that the water-bottle comes easily first as a source of disease. A man takes pains to burnish the stopper of his water-bottle or to keep the strap that carries it clean, but he rarely takes the trouble to purify the inside. Pure water is carried in it to-day, polluted water to-morrow, and so on, without any attempt to clear out any likely germs of disease before putting fresh water into it.

To keep a bottle pure it should be rinsed out occasionally with warm water and soda, or a little permanganate of potash dissolved in water will free it from the impurities of any water that may have been carried in it previously.

I have mentioned before how a small tin of permanganate of potash should be carried in the haversack of a soldier on service. Besides being useful for easing the feet when scalded, it makes an effective solution for rinsing out the water-bottle and keeping it free from germs. It should always be used when the previous day's water supply has been taken from a doubtful source, and the bottle rinsed with it before putting in the fresh water.

The less the water-bottle is used for drinking from the better, whatever pains may be taken to keep it clean. Drink from it only when absolutely necessary, as when on the march and no other utensil is available, and then as little as possible. Some men keep their water-bottles filled for use in their tents whilst in standing camps. This is both a lazy habit and dangerous to the health.

There is much ignorance of what constitutes pure water prevalent amongst men. Water that is clear and sparkling is looked upon as pure and safe to drink without being boiled, whilst thick or muddy water is looked on as certainly dangerous to drink.

The purity, however, of water depends on the source from which it is drawn. For instance, water drawn from a well in the centre of a town, as is usually the case in the up-country towns in South Africa, is more likely to be contaminated with fever germs, though it may be clear as crystal, than that drawn from a muddy river or spruit miles away from any town or habitation.

During the rainy season the rain washes the street and yards of the houses, carrying with it refuse and microbes to the town well, there to stagnate and multiply.

I have noticed numerous cases of men who have shuddered at and drank but sparingly of the muddy water from spruits or rivers miles away on the veldt, and who yet drank deeply of the clear water of a well near a town, in the belief that the water being clear must certainly be pure.

Water from wells or from a stream or river in the vicinity of a town or village should never be drunk without first boiling it, no matter how clear it may look.

Rain water, if it is caught in a clean vessel, is good to drink as it is, but drawn from ruts in the ground or from crevices amongst the rocks, should be treated as unsafe.

Perfect cleanliness of all cooking utensils is indispensable to good health, and whilst on this subject I may point out the danger to health which accrues from the manner in which the camp kettles are usually cleaned in camp.

The place allotted for the refuse pit is usually alongside that of the latrines, and here the process of cleaning the camp kettles is generally performed by the mess orderlies after dinner. If warm water is obtainable it is brought from the camp kitchen, or if not, as is often the case, the soil from the ground mixed with cold water is used to scrub off the grease.

As the soil near the refuse pit and latrines is invariably polluted with urine, which is known to be a conveyer of enteric germs, the danger to health of this practice is apparent. The camp kettles should be always cleaned as far away from latrines or refuse pits as possible, especially when soil or sand from the ground is used.

Another danger to health is the practice of carrying spades used for filling in latrine pits on the same cart as the camp kettles or other cooking utensils—a frequent occurrence.

The soldier's canteen is another utensil likely to be a source of conveying disease germs, if not kept thoroughly clean, or the cleaning performed in an insanitary manner. This affects the soldier individually, so that it rests with him whether or not this

useful utensil is converted into a source of disease or remains the handy article it is intended to be.

A canteen serves many purposes on service. It is at different times a washing basin, a cooking utensil, a drinking can, and a dinner tin.

When water for washing purposes is scarce it is sometimes issued at the rate of a canteenful per man. It is usual then to wash, using the canteen as a wash-basin. Provided the canteen is cleaned again before being used as a drinking vessel, this proceeding, though hardly commendable, may not be the cause of much harm. Hot water for cleaning the canteen is rarely obtainable on service; sand, grass, or soil is the usual substance employed.

When this is the method employed never use sand from the neighbourhood of the tents, pits, or latrines, or any place likely to be polluted by urine. It is safer to go some distance away from the camp.

Whenever possible give the canteen a good scouring out with soap and hot water, or soda if obtainable. If used for cooking clean the canteen immediately afterwards. Do not leave it dirty till required for use again; the tin will be more easily cleaned whilst it is warm.

Dirty canteens, scraps of food, &c., lying about the tents, attract swarms of flies, and there are no greater conveyors of disease germs than flies. They may have been resting on putrid or decaying matter, sewage, &c., before alighting on the tents, and thus transfer the microbes of disease to the food of the men.

Anent this subject, I had the good fortune recently to spend a week's training in camp with a volunteer corps which had a dining marquee erected in camp. All meals were partaken of here, and the dining utensils were kept in the marquee. The result of this was that, although the locality was particularly fly infested, there were very few flies in the vicinity of the tents; whilst in the other regiments of the brigade they swarmed about the sleeping tents where the food was kept and the meals partaken of. It struck me as an idea that might be adopted in all standing camps. Dining rooms have already been adopted in barracks with great success, and I think that for hygienic reasons dining tents in standing camps are even more necessary.

I need hardly impress on men the importance of keeping the interior and vicinity of tents scrupulously clean, and free from scraps of food and other decaying matter which attracts flies, and also of keeping the ground unpolluted with urine.

In camps at home where numbers of men spend their time drinking in the canteens till closing time, and have to be in bed with the lights out within another half hour, there will invariably be a great deal of urinating about the tents, no matter how strict are the precautions taken to prevent it. If sentries are posted to stop the evil the urine is thrown under the tent flies. I have even seen drinking vessels used for the purpose.

Only by the individual efforts of the men themselves can the sanitation of camps be thoroughly carried out. Let every soldier take an intelligent interest in carrying out the rules of sanitation and in keeping his tent and its vicinity unpolluted, and he will accomplish more in defeating the ravages of disease than all the unaided efforts of the authorities.

General Sir Ian Hamilton, in his book on the war in Manchuria, brings this fact forward when he states that "the good health of the Japanese troops was largely due to themselves carrying out very strictly the rules of sanitation."

Another and common offence against the laws of health is the habit of spitting inside the tents, or even in their vicinity. Spittle is well known to convey the germs of consumption. So well is this fact recognized that it is now made an offence against the law to spit in any public place.

During the night men usually spit behind their heads, often on the tent flies. The spittle dries here and the microbes of disease are spread about the tent by the wind. When from fifteen to twenty men may be sleeping in one tent, the risk of infection from this source is apparent, for not only are the germs of consumption contained in spittle, but many other diseases are conveyed by the same agent.

It is advisable when campaigning in tropical countries to wear a flannel belt around the loins and stomach. Troops are always issued these "cholera belts," as they are called, when proceeding to the Tropics, but many men, from their ignorance of the utility and importance of wearing these belts, either refuse to wear them or evade the orders to do so which are sometimes given.

The stomach, with its intricate and delicate organs, is more susceptible to changes of temperature than any other part of the human system.

It is, therefore, necessary that the natural heat in this region should be preserved by artificial means so as to keep up a regular temperature, and so guard against the risk of taking chill, which is usually a precursor to dysentery.

The exigencies of active service may entail severe exertion during the day, with the chance of having to sleep on the ground for the night with no other covering but the clothing worn on the body; it is then natural that a flannel belt worn around the loins by keeping the stomach warm will lessen the risk of chill.

Where malarial fever may be prevalent, it is still more imperative that the region of the stomach be kept to an even temperature, if one wishes to minimize the risk of infection.

I always made it a practice when sleeping in the open to place any extra weight of bed-clothing I might have around my loins, or, even when cut off from my blankets and greatcoat, if I could secure an old sack, or any other such covering, I placed it over the same region. To this practice I attribute to a great extent my immunity from chills or cramp in the stomach, and the fact that I was seldom troubled with diarrhœa.

I still continue to wear a cholera belt, for I consider that it is as beneficial in England—with its sudden and many changes of temperature—as it undoubtedly is in the Tropics.

The chief objection to the cholera belt, and the reason I usually heard given for the discontinuance of its wear by many men during the South African campaign, was that it bred vermin, or, to use their own words, "was a regular louse-trap!" The expression was hardly a misnomer, for the cholera belt was a louse-trap; but one that was more to the discomfort of the lice than to the wearer. As I often pointed out to men when they raised this objection to the wearing of the flannel belt, it did not breed the vermin, but they simply collected there during the night owing to the warmth, and that if the belt was taken off for a while each morning the vermin could be more easily destroyed or removed before they spread over the body.

The verminous state of the men during that campaign was in many cases—as far as the men were concerned—unpreventable, whilst in other cases the evil could have been diminished by the co-operation of the men themselves with the authorities.

As an instance, I will give the experience of the brigade to which I belonged to show how this evil was unpreventable by any action of the men themselves. After the series of operations for the relief of Ladysmith, during which there was little opportunity to wash or change our underclothing, we entrained for Durban, and embarked for East London. Most of us were still wearing the clothing we had been operating in on the Tugela, so that we were all verminous, which, however, was nothing like the state we were in afterwards.

From East London we entrained for the Orange River Colony, operating for the relief of the Colonial Brigade, then surrounded at Wepener. We were then hurried around to near Kimberley, where the Mafeking relief force was forming. With this force we marched off to Fourteen Streams, where after a short engagement we occupied the vacated positions of the enemy. Here we remained a few days and were fortunate enough to obtain a complete change of clothing, and were able to rid ourselves of our ragged and vermin-covered Natal clothing. We then commenced a continuous march through Bechuanaland around the Western Transvaal to the north, and backwards and forwards for a period of six months, with barely a day's rest in between, and no change of clothing.

The usual method of the march was to start before daybreak, and finish up in the dark. The blankets were consequently packed on the carts all day, so that they were never exposed to the sun or had any chance of airing. There was also no opportunity to wash our underclothing, and very few chances of a bath during this march.

What wonder then that we were literally swarming with vermin. Even Japanese troops, who are attributed with all the virtues of perfect sanitation, could not under these circumstances have prevented themselves from being in the same state.

I do not quite believe, however, after my experience of that march, that being verminous has such a great effect on the general health, for I do not think it possible to encounter in any army a healthier or a finer conditioned lot of men than were the troops comprising this force at the end of the march.

Whilst in cases like the above there may be some excuse made for men being in this condition, there is certainly no reason why men should be allowed to become verminous in standing camps where water for bathing and washing should be plentiful.

In this case the presence of vermin indicates that the rules of hygiene and sanitation are not being correctly observed, so that though disease may not be caused directly by the vermin, it is obvious that the way is being prepared for its attack by the neglect of these rules.

Sun, water and soap are the three great enemies to the production of vermin. Underclothing should be washed as often as possible, occasionally with hot water if it can be procured. If water is scarce, or it is not convenient to wash the underclothing, this should be brushed with a stiff clothes brush, particularly under

the seams, and then left out in the sun for as long as possible. This operation should not be performed near the tents as the ground may become pervaded with vermin. It is always better to go some distance away.

Blankets should not be folded either inside or outside the tents in fine weather, they cannot get aired in that manner. They should occasionally be taken some little distance from the tents and spread over the ground. The longer they are exposed to the sun in this manner the better; there is no better preventative or destroyer of vermin than the sun. When I have been on detached posts and able to look after my own blankets, I have always freed them from vermin by this means in a few days, no matter how thickly infested they were. Vermin cannot stand sunshine.

In brigade or regimental camps it is sometimes impossible to get one's blankets away to air them, owing to the craze for having them neatly folded and in as small a compass as possible. Where the unit may have to strike camp and pack at a moment's notice it is certainly convenient and desirable to have the blankets rolled and strapped together in bundles ready for the wagons, but at all other times it would be better for sanitary reasons to have them spread out to air whenever convenient.

By the way, who ever saw blankets being washed on service? This operation could have been performed by troops, or companies, on many occasions during the South African War. I say by troops or companies for the reason that it would be futile for an individual to wash his blankets when he may have a different one or pair the following day, or the object of washing defeated by their being packed with the unwashed ones.

Blanket washing could have been carried out on many occasions, as when camped near a river or stream, and a few hours under an African sun would have dried them again.

Soldiers, as a rule, do not require any pressure to make them bathe; when a river or other water is convenient they are only too willing to avail themselves of the opportunity. In the absence of streams a bath can be had by filling an empty biscuit tin with water, lathering the body over with soap and a wet piece of flannel, then pouring water over the body with a canteen or any other small vessel which may be procurable.

If water is scarce and only one canteenful can be had, pour it gradually on the flannel, rubbing the body over with it, then give yourself a good rub down with a towel. A good brisk rubbing with a towel, even if no water has been used, and brushing the

shirt before putting it on again will help to keep the body clean and free from vermin.

Whilst on the actual line of march, when, as in the case I have quoted, opportunities may not exist for the close observation of the rules of cleanliness and sanitation, there is usually, despite this want, a better condition of health amongst all ranks and less casualties from enteric or other fevers than when quartered for any length of time in standing camps. This fact is accounted for by the regular daily exercise of marching, coupled with the advantage of a fresh and unpolluted camping ground each night.

In standing camps, especially on the conclusion of a continuous and hazardous march, men are inclined to spend much of their available time in rest or fall into a state of lethargy which in the absence of their accustomed daily exercise lowers their vitality, and leaves them more prone to attacks of disease at the very time that the chances of infection are increased. To guard against this it is necessary to take as much exercise as possible whilst in camp, and to spend as much of the day as is permissible away from the neighbourhood of the tents. An afternoon spent in kicking a football about, or participating in any other sport or game, or even a good walk as far as the bounds of the camp allow, is far better and more conducive to good health than spending the time sleeping or lying down in the tents.

Again, the diet of a standing camp is usually more liberal and the additions to the usual rations more frequent, as are also the opportunities of purchasing extras, than on the line of march. This naturally suggests the necessity for exercise to counterbalance the effects of increased food, with a lesser task to perform.

The ration of jam, which was a feature of the South African campaign, was a most effective addition to the ordinary ration, as not only did it counterbalance the effect of a plentiful diet of meat without fresh vegetables, but it was a sustaining article of diet as well. This fact was made evident to me on our long march, when for a great part of the time we were on reduced rations. The jam ration was issued on alternate days only, and I always found my strength was better sustained on the days when I received jam for breakfast than on the days when I was without it.

When opportunities occur for purchasing additions to the Government rations, such as the arrival of a field force canteen, or being quartered in the vicinity of a town, it would be well not to buy potted fish, tinned sausages, bloater pastes, or so-called ham and chicken paste.

Fresh fruit, condensed milk, chocolate, Quaker oats or any other brand of prepared cereals, are the best, and most useful articles to buy as additions, or in lieu of the usual ration, by way of a change.

Fresh pork is a highly dangerous article of diet in hot countries, especially to men fatigued by long marching, and who have been for a long time on a fixed and unvaried diet. I have myself witnessed the evil results of this on several occasions.

Towards the end of the long march I have before referred to, some men belonging to our brigade secured a live pig, which they slaughtered and ate between them, having partly cooked it. Every one of the party who partook of the pork was seized with severe illness soon after, which proved fatal to four of them.

When performing long marches on reduced rations, it is well to try and save something to eat before going to sleep for the night, that is, if the chief meal of the day has been made during the midday halt. The risk of taking chill in the stomach is greater when no food is contained in that organ than when something has been eaten before lying down. When on three-quarter or even half-rations, I always made it a rule to save a biscuit or even half a one, to eat before going to bed, no matter how hungry I may have been. This is more necessary when sleeping out in the open in frosty or damp weather.

Opportunities often occur on service of procuring fruit from orchards and other places on the line of march, and when such opportunities occur men usually take full advantage of it, eating of the same "not wisely but too well." Fresh ripe fruit is not likely to cause much mischief if moderately indulged in, but fruit if over ripe, or not ripe enough, is likely to cause cramp of the stomach or diarrhœa, especially if partaken of when the eater is in a tired and fatigued condition from marching on a sparse or reduced ration. Peaches, or apricots—fruits which are usually plentiful in countries where campaigning falls to the lot of the British soldier—should not be eaten before the skins have been removed, as their skins are most indigestible.

There is much diversity of opinion as to whether alcohol is necessary to the health of men on active service or not.

Personally, I think that beer is beneficial when supplied to the men on issue, at the rate of a pint or two per day, as was the custom in South Africa whenever it was possible to procure it. It kept men from drinking water in standing camps when they knew that at certain fixed hours of the day they could satisfy their thirst

with a pint of beer, which, whatever other demerits it may have had when compared with water, was free from microbes of fever. The popularity of the daily issue of beer in camps may be best judged by the fact that many men who were teetotallers before, and no doubt have now returned to their former abstinence, had their two pints of beer on these occasions, notwithstanding the fact that it cost them a day's pay for the luxury.

The issue of rum—which many condemn as wasteful and unnecessary, and advocate hot coffee as more beneficial, forgetting that coffee requires hot water to make it, which cannot always be obtained on service—is, in my opinion, based on a personal experience of its merits, a most useful ration, conducive to the health of men on occasions, such as when arriving at the end of a day's march wet to the skin, and with the possibility of having to bivouac on the wet ground.

I have seen very few men refuse their ration of rum on occasions like this, whether they were teetotallers or not, and I think they were wise not to, for the rum issued under these circumstances is intended as a medicine to prevent cramp or chill of the stomach. The only effective substitute I could recommend for rum would be a reliable meat extract, such as bovril or lemco, to prepare which, however, would also require hot water.

I often wonder why meat extracts are not used more extensively as an additional ration on service. I know of no better recuperative when one is fatigued or run down from excessive marching or any exertion during intense heat, than a cup of hot meat extract liquid. It is much more effective than iced lemonades or cold drinks, and without the dangers likely to ensue to an overheated system from drinking these fluids. Meat extracts have the advantage as a ration that they are so compressed that their carriage is not likely to occupy any great amount of transport. It would be a great boon to men when on the march on dry rations to have an occasional issue of the same during a long halt, when water could be boiled, and much more effective than tea or coffee. I had an opportunity during the South African campaign of testing the effects of this. It happened that just before starting on a march, the English mail arrived, bringing me a small parcel from home. It contained amongst other articles a jar of bovril, which I carried with me on the march. The weather at this time was exceedingly hot, and our rations consisted exclusively of preserved meat and biscuit. The marches were long and drawn out owing to the number of ox-wagons in the convoy. This, coupled with the excessive heat, so

knocked me up, that I could not attempt to eat the tinned meat, which is never very palatable in hot weather. Luckily, however, I had the small jar of bovril, with which, when I arrived at the end of the day's march, I made some hot liquid in my canteen, and soaking some biscuits in it, made a meal which, for invigorating effects, I have never experienced anything to equal.

Whilst I admit the good effects of beer or rum, when issued as I have mentioned, I would caution men against the use of native liquors or spirits, which, despite the precautions taken by the authorities to prevent such dangerous concoctions reaching the men, are sometimes procured surreptitiously.

I have seen the maddening effect of these vile drinks on men who have become in possession of the same after, perhaps, months of exertion and privations. Even to the natives, or white inhabitants—the very lowest class only of whom ever drink such stuff—they are slow poison, but how much worse must be their deadly effect on men who have been subject to long privations and abstinence from alcohol of any kind. Numerous cases have come under my own notice of men to whom a single debauch on these deadly drinks has proved fatal in a very short time.

The casualties from pulmonary diseases that occur on active service, despite the exposure to all sorts of weather that campaigning entails, are very few in comparison with those from fevers. This is accounted for by the invigorating influence on health of a life in the open air. I have, however, frequently seen men fresh to the country over anxious about the possibility of catching cold, or rheumatism, when they have had to sleep in wet blankets, or bivouac in wet weather. It is a curious fact that men should be so anxious about the risk of a cold, and yet so careless of the greater and more deadly possibilities of contracting fevers.

Wet blankets—though it is advisable to dry them when possible—are not likely to cause any trouble to the health of a man who is leading a life in the open, nor is the fact of his having occasionally to sleep in wet clothing. The great requirement is to keep oneself warm during the night, even when the coverings are wet. It is far better to sleep enveloped in the wet blanket, which I have usually found to be warmer even than dry ones, than to sit up awake in the tent shivering with cold, as I have not infrequently seen men doing. There is more possibility of contracting a cold or more serious trouble in this way, as added to the low temperature of the body there is the weakening effect of want of sleep.

Over anxiety regarding the chances of contracting disease whilst

on service is not, however, conducive to cheerfulness and, therefore, not commendable. Fear or nervousness about the risk of catching a particular disease, which may be unusually prevalent, by depressing the spirits, and predisposing the mind towards the prevailing malady, leaves the body more susceptible to contagion from the disease on which the fears are concentrated.

Soldiers, either when on service or otherwise, are not, however, prone to much anxiety about their chances of contracting any disease which may be prevalent in the locality in which they are quartered; they usually go to the other extreme, and are either careless about the matter, or so indifferent as to neglect the simplest and most ordinary precautions to minimize the danger to which they are exposed.

My object in writing these pages has been to modify this indifference to laws of health and sanitation, and to impress on my readers the great importance of the individual soldier assisting the authorities in carrying out the rules of hygiene and sanitation, thereby helping to diminish the excessive casualties and mortality from disease whilst on active service or in occupation of countries where enteric and other fevers are prevalent.

United Services Medical Society.

THE MEDICAL SERVICE WITH LORD METHUEN'S FORCE DURING THE ADVANCE ON KIMBERLEY, 1899.

By Lieutenant-Colonel C. H. BURTCHAELL.
Royal Army Medical Corps.

(*Continued from p.* 572.)

Transfer of Sick and Wounded to Orange River.

From November 21 to December 14, about 1,430 sick and wounded—1,010 wounded, including 90 Boers, and 420 sick—were received at Orange River. They arrived there as follows: 170 on November 24, after Belmont, 107 on November 27, after Graspan, 436 on November 29, after Modder River, and 523 on December 12, 13 and 14, after Magersfontein. Smaller convoys, totalling 194, arrived on various dates.

Before the advance began the P.M.O. Field Force was told that Lord Methuen's Division would return immediately after the relief of Kimberley, and that the Orange River line of communication would be closed; consequently no arrangements were made to establish a stationary hospital or other line of communication medical unit north of De Aar. There were no local facilities for hospital improvisation at Orange River, where, in addition to the railway station, there were only a few small houses, and a store kept by the local tradesman. The half field hospital under Major H. P. Birch, and the field hospital under Major Greenway, which were left behind when the troops advanced, were augmented by Major Murray's field hospital which arrived on November 22 to join the Highland Brigade. These units, providing approximately a combined personnel of eleven officers, including two quartermasters, and about eighty-five other ranks, dealt with the sick and wounded from Belmont and Graspan.

On November 24, the day transfers from Belmont were received, Surgeon-General W. D. Wilson, P.M.O. Field Force, and Mr. G. H. Makins, Consulting Surgeon, arrived at Orange River. The Surgeon-General then seeing that the movement towards Kimberley was of a more serious character from a medical point of view than was at first anticipated, telegraphed for some of the Staff of No. 3 General Hospital to come up. Accordingly two officers with thirty-

seven other ranks arrived just before the wounded from Modder River came down from the front on November 29.

It was the wounded from this fight that threw the greatest strain on the medical resources at Orange River, but notice of their arrival was fortunately received in time to permit of all preparations possible being made. No 2 Ambulance Train had taken 92 of the wounded remaining from Belmont and Graspan to the Cape on November 28, and other patients fit to move were sent down to De Aar by ordinary trains. Ten large Ordnance Store marquees were pitched to supplement the field hospital tents; fatigue parties were detailed to be in readiness to assist in unloading the trains; buckets of water were provided at the station, and all officers of the garrison[1] were asked to send lanterns; occupants of verandahs and stoeps were directed to give them up. The trains conveying sick and wounded, 433 patients, arrived after dark. It was raining and unloading trains was difficult owing to want of sufficient lights. Three men died on the journey from Modder River, and a wounded Boer died while being carried from the train. "It was late at night before all were transferred to the tents. Very little could be done for them that night except to provide food, and even that was hardly touched as the men were so dog-tired that they only wanted to be let alone and to go to sleep."[2] "Only field medical equipment was available, and the wounded lay on the ground packed like herrings in a barrel; dressing them under those conditions was highly unsatisfactory."[3] On the following day the Cape Medical Staff Corps Bearer Medical Company (for the Highland Brigade) arrived and helped the field hospitals. The medical personnel at Orange River when this unit came up was about 16 officers, and 170 other ranks. On the same day, November 30, No. 3 Ambulance Train took 115 of the wounded on to Cape Town, and on the next day No. 2 Train left with 116; No. 3 Train returned and left again on December 5 with 97. Thus within a week 328 wounded had been disposed of and happily the unfortunate conditions owing to want of sufficient hospital equipment were not unduly prolonged.

The two ambulance trains certainly saved the situation so far as Orange River was concerned, and but for the very efficient working and control of those units under the command of Major M. W. Russell and Captain C. C. Fleming, D.S.O., the rapid evacuation of

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[1] The Highland Brigade Staff with the Black Watch were at Orange River, also various details.

[2] Major W. H. Murray. [3] Major Coutts.

the field hospitals, especially after the battle of Magersfontein, would have been impossible or could only have been carried out with great discomfort to the wounded.

On December 2 and 3 the Highland Brigade Field Hospital and Bearer Company left for Modder River Camp. On December 4 the P.M.O. Field Force returned to Cape Town, and Lieutenant-Colonel W. Donovan, temporarily withdrawn from his duties as P.M.O. of the Cavalry Division, arrived to act as Administrative Medical Officer. Colonel Young, of the Red Cross Society, arrived about the same time with a supply of shirts, pyjamas and other articles which were very useful.

"Shortly before the action at Magersfontein a cypher telegram was received at Orange River warning the P.M.O. to 'look out for the 11th.' All possible tents, bedsteads, and stores of all kinds were at once commandeered and the local shop searched for anything useful. The Ordnance officer, anxious to help, had nothing to give, and in the ordinary course requisitions on Cape Town would not have been complied with for weeks. The local storekeeper offered to get up, at a price, some of the articles required. He did so and was paid many times their value, but at the time they were invaluable to the hospital. No. 3 Ambulance Train, which was about to proceed to Cape Town, and No. 2 Train, halting at De Aar, were ordered to proceed to Modder River on December 11. Some 500 sick and wounded were taken in immediately after Magersfontein, and those not discharged to duty locally were gradually transferred to the base. The wounded did remarkably well, considering the absence of all ordinary hospital conveniences."[1]

The following is a note by Mr. Makins, who stayed at Orange River until December 19:—

"There was plenty of food, also of dressings and drugs. There were practically no beds, a little hay was strewn on the ground covered with a mackintosh sheet and a grass pillow and a blanket were provided for each man. I did not consider that the men were uncomfortable on the ground.

"After Modder River the most unsatisfactory hospital was the one hastily improvised with ten commissariat marquees. These tents blew down the first night after they were erected, but were then fortunately empty. Later they were used and very densely filled. There were a lot of serious injuries of head and neck (ten), paraplegias (eight), wounds of belly (fifteen), wounds of chest, &c.

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[1] Lieutenant-Colonel W. Donovan.

There was almost entire absence of any basins or similar articles of hospital furniture. With the aid of the Red Cross commissioner I arranged and furnished a small operating room at the station, and I had to lend people my small stock of utensils to aid in carrying out the ordinary dressings. On the second or third day after the Marquee Hospital came into use a very heavy shower swamped the ground on which it stood, and the patients had to be temporarily removed from the water. I do not think any one was the worse for this accident. The men were, however, fearfully crowded; there were not enough orderlies; it was exceedingly hot, dust blew, and the men got covered with a complete coating of mud. Major Coutts and I spent a good part of a day with sponges and water washing these men, to try and make them a little more comfortable.

"The Royal Engineers and Ordnance Department were very good about making splints and appliances for us; without them I do not know what we should have done to meet the requirements for such necessaries.

"There were only two special tents. In one all the belly wounds were placed for special observation and treatment; I think I had as many as fifteen at a time. These patients were watched till they were considered safe, and the last batch of them went down to Wynberg on December 5. I visited some of the ambulance trains as they went down and removed patients who seemed ill. One was an officer with wound of cæcum, the only intestinal wound that recovered after operation by me. I operated on four other cases, two Boers and two Englishmen, all four on the third or fourth day when they had already severe peritoneal infection, and all died. A stomach case lived about a week, but eventually died from subdiaphragmatic abscess.

"The other special tent I was very keen upon. A big boom was erected in the length of a marquee, and on either side men were arranged in rows with fractured femurs put up in Hodgen's splints. These fractures did well, only one died, whilst those sent direct to Wynberg did very badly.

"My criticism at the time I still hold to. The whole of our troubles depended upon the entire absence in the scheme of a proper 'stationary unit.' If the Marquee Hospital put up had been a segment of one of the general hospitals sent forward properly equipped the wounded could have been properly managed. As it was, the hospital (other than the field hospital) was purely and simply ten commissariat marquees. My view was that the general

hospitals should be arranged in sections for this purpose. During my stay at Orange River I made one journey down to Cape Town to ask that we might have some more satisfactory material sent up. After December 19 I remained for some three months as consultant at the base. My position then was a satisfactory one for a consulting surgeon, as I saw the cases when they came off the field and again at the base, and was often able to afford information and advice, since the whole course of the cases was familiar to me."

General Notes Supplied by Various Officers.

Captain J. W. H. Beach: (1) The regulation system of disposing of the arms, &c., of wounded brought to field hospitals was found unworkable. To a large extent the arms and equipment of the wounded became separated from the owners, the wounded often being brought in on one wagon and the articles on another at some other time. At Graspan, and more particularly at Magersfontein, wagon loads of arms and equipment were dumped down in the hospital, when the personnel was too much engaged with the wounded to spare time to make any attempt at sorting. As far as possible articles brought in with a wounded man accompanied him to a tent and when he was transferred towards the base. It was impracticable to make out pack store cheques—especially during the night. From Magersfontein numbers of wounded arrived at the 9th Brigade Field Hospital at Modder River in darkness, and many were transferred to ambulance trains at night, and moreover, sick convoys were arranged and despatched too hurriedly to admit of regulation being complied with. In compliance with divisional orders, units removed the arms, &c., which were of any use to them; the remainder were passed on in bulk to the Ordnance Department, who brought them on charge by certificate voucher.

(2) It would be a good rule that empty ambulance trains proceeding to the front should carry a reserve of surgical stores for urgent issue to any field hospital requiring it.

Captain S. Guise Moores: At Belmont, a man of the Scots Guards received a severe wound of the right arm above the elbow. The first field dressing was applied by a comrade, who also put on a pebble-handkerchief-stick tourniquet, which was twisted very tight. When the tourniquet was removed, not long afterwards, bullæ had already formed on the surface of the limb and gangrene set in. The wound was re-dressed and the man sent to the field hospital, but by the afternoon the gangrene had extended to a point near the insertion of the deltoid, necessitating amputation at the shoulder-joint.. This case indicated the danger of improvised tourniquets applied by amateurs.

Captain J. E. Carter: After the actions at Modder River and Magersfontein many officers and men of Highland Regiments suffered from

severe burns behind the knees, caused by exposure to the sun when lying prone on the ground for many hours. The skin exposed between the bottom of the kilt and the top of the hose was in many cases badly injured; several men suffered from burns of the second degree. The condition can be avoided by turning up the top of the hose above the knee, but the unusual conditions under which fighting commenced often prevented that being done.

Lieutenant G. B. Crisp: At Voetpads Drift a wounded gunner rode up to me without help, though he had a fractured femur, the fracture being due to a gunshot wound somewhere near the middle of the thigh. One of my stretcher parties brought in a youngster belonging to one of the Guards regiments. He kept moaning and saying, "I have been shot in the back and the bullet is in my stomach, and I've been lying out on the ground all night." With great difficulty could I get him to let me move him at all. I saw there was no hole in his jacket except where a bullet had grazed his shoulder, and finally I found that he was not wounded at all, except for that slight graze. However, he could not be convinced of it. My theory was that when running he got the graze on his shoulder, which probably knocked him over and he thought a bullet had entered his body.

At Belmont I picked up a wounded Boer who had been shot through the knee. The bullet had drilled a clean round hole through the centre of the patella and had emerged exactly in the middle line behind. I had the man carried into a farmhouse near by and thought he would be no more use during the war. Much to my surprise when we took Boshof about four months later, a man who was attending to a lot of wounded Boers in there came up to me and asked me if I did not recognize him. He was my friend of Belmont walking about with a perfectly flexible knee, but he said he had had enough fighting and had donned the Red Cross.

Captain J. V. Forrest: After Graspan, a man, on patrol, was shot in the chest, through the pericardium. He subsequently recovered completely, and wrote of his friends saying that he was making a good thing out of going round the clinics of the hospitals in London.

APPENDIX A.

Statistics of Killed and Wounded.

In common with the available statistics of killed and wounded of most wars, no two accounts of the actions under discussion will be found to exactly agree as regards the total casualties or the proportion of killed to wounded. There are many causes of such discrepancies, but the two primary sources of variation are: (1) Slightly wounded reported on regimental and not on medical service returns, and (2) cases that die soon after admission to a medical unit, being entered in one return under wounded" and in another under "killed."

The total casualties, proportion of killed, &c., in these actions are very completely analysed in Mr. G. H. Makins' book, "Surgical Experiences in South Africa, 1899-1900." The figures dealt with by him, which were supplied in the field soon after the actions were fought, differ very slightly from those in the tables below. The data for these tables have, however, been arrived at by a different method, having been extracted with great care and much labour by Mr. G. Biddiscombe, of the Medical Statistical Branch of the War Office, from the card index of all admissions to hospital during the South African War, and checked with all the available official returns or records of casualties. The particulars required to complete the final results of wounds as regards discharge to duty or discharge from the Service were supplied, in the case of the Royal Navy and Royal Marines, by Fleet-Surgeon Lawrence Smith, R.N., of the Admiralty, and in other instances, not shown in the hospital books, by various regimental record offices.

Tables I, II, and III explain themselves. Men returned as missing, of which there were very few, are excluded. The more correct method of stating the proportion of killed to wounded appears to be that which includes under "killed" moribund cases that die in the field hospitals within forty-eight hours of admission.

Mr. Makins, in his work mentioned above, page 15, says: "From the surgical point of view these men all received mortal injury, and are, therefore, properly included among the fatalities. Their inclusion, moreover, makes an appreciable difference in the percentage proportion of mortal injuries to wounds." In the Russo-Japanese War, 1904-1905, the Japanese returned such cases as "killed." [1]

This method was not, however, adopted during the South African War. The total admissions during the whole war for wounds in action were 22,899, and the deaths in hospital from wounds 1,549, or 6·76 per cent of the admissions.[2] Taking the 3·4 percentage of wounded admitted who died in the field hospitals within forty-eight hours, in the total of the four actions given in Table I, as an approximate index of a probable constant, and deducting it from 6·76, we get a 3·3 death-rate from wounds for the whole war, or a close approach to the actual 4·1 percentage of deaths in hospital from the four actions, moribund cases excluded.

The percentage of deaths from wounds amongst admissions for wounds in the Japanese forces in Manchuria was at least 5·6, or possibly a higher figure, as that percentage is taken from a series of results which at the time they were obtained (1906) left 7·4 per cent of the wounded un-

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[1] "Medical and Sanitary Reports from Officers attached to the Japanese Forces in the Field," General Staff, War Office, 1908, p. 308.

[2] War Office official figures.

TABLE I.

	Belmont 23.11.1899				Graspan 25.11.1899				Modder River 28.11.1899				Magersfontein 11.12.1899				Total—Four Actions				
	Officers	Other ranks	Total	%	Officers	Other ranks	Total	%	Officers	Other ranks	Total	%	Officers	Other ranks	Total	%	Officers	Other ranks	Total	%	
Total hit	28	270	298	3·4	9	176	185	4·0	23	460	483	4·7	66	795	861	7·5	126	1,701	1,827	5·2	% of troops engaged*
Killed	3	50	53	17·8	3	14	17	9·2	3	66	69	14·3	20	149	169	19·6	29	279	308	16·9	% of total hit
Wounded	25	220	245	82·2	6	162	168	90·8	20	394	414	85·7	46	646	692	80·4	97	1,422	1,519	83·1	% ,, ,,
Wounded, not sent to Field Hospitals	2	13	15	6·1	–	5	5	3·0	5	–	5	1·2	2	5	7	1·0	9	23	32	2·0	% of total wounded
Admitted to Field Hospitals	23	207	230	93·9	6	157	163	97·0	15	394	409	98·8	44	641	685	99·0	88	1,399	1,487	98·0	% ,, ,,
Died in Field Hospital within 48 hours	1	9	10	4·4	1	5	6	3·7	1	11	12	2·9	2	20	22	3·2	5	45	50	3·4	% of admissions to F.H.
To duty from Field Hospital	1	8	9	3·9	–	1	1	·6	2	18	20	4·9	–	21	21	3·1	3	48	51	3·4	% ,, ,,
Sent to Line of Communication	21	190	211	91·7	5	151	156	95·7	12	365	377	92·2	42	600	642	93·7	80	1,306	1,386	93·2	% ,, ,,
Returned to duty in S. Africa	12	82	94	44·6	2	93	95	60·9	6	181	187	49·6	21	316	337	52·5	41	672	713	51·4	% of total sent to L. of C.
Died	2	13	15	7·1	–	4	4	2·6	–	18	18	4·8	2	20	22	3·4	4	55	59	4·3	% ,, ,,
Invalided to England ..	7	95	102	48·3	3	54	57	36·5	6	166	172	45·6	19	264	283	44·1	35	579	614	44·3	% ,, ,,
To duty in England ..	7	63	70	68·6	3	37	40	70·2	6	106	112	65·2	19	162	181	64·0	35	368	403	65·6	% of total sent to England
Died on board ship or in England	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	% ,, ,,
Invalided from the service	–	32	32	31·4	–	17	17	29·8	–	60	60	34·8	–	102	102	36·0	–	211	211	34·4	

* Guards Brigade not included in strength of troops engaged at Graspan, and 9th Brigade not included at Magersfontein.

TABLE II.—PERCENTAGE OF CASUALTIES AND PROPORTION OF KILLED TO WOUNDED, IF DEATHS WITHIN FORTY-EIGHT HOURS ARE ADDED TO KILLED ON THE FIELD.

—	Belmont				Graspan				Modder River				Magersfontein				Total			
	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent
Total hit ..	28	270	298	3·4	9	176	185	4·0	23	460	483	4·7	66	795	861	7·5	126	1,701	1,827	5·2 of troops engaged
Killed ..	4	59	63	21·1	4	19	23	12·4	4	77	81	16·8	22	169	191	22·2	34	324	358	19·6 = 1
Wounded ..	24	211	235	78·9	5	157	162	87·6	19	383	402	83·2	44	626	670	77·8	92	1,377	1,469	80·4 = 4·1

TABLE III.—FINAL DISPOSAL OF WOUNDED ADMITTED TO FIELD HOSPITALS, EXCLUDING HOPELESS CASES THAT DIED WITHIN FORTY-EIGHT HOURS.

—	Belmont				Graspan				Modder River				Magersfontein				Total			
	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent	Officers	Other ranks	Total	Per cent
Total cases ..	22	198	220	95·6	5	152	157	96·3	14	383	397	97·1	42	621	663	96·8	83	1,354	1,437	96·6
Returned to duty	20	153	173	78·6	5	131	136	86·6	14	305	319	80·4	40	499	539	81·3	79	1,088	1,167	81·2
Died	2	13	15	6 8	–	4	4	2·6	–	18	18	4·5	2	20	22	3·3	4	55	59	4·1
Invalided as unfit for further service	–	32	32	14·6	–	17	17	10·8	–	60	60	15·1	–	102	102	15·4	–	211	211	14·7

accounted for.[1] It seems probable, therefore, that the case results of wounds were more favourable in the British forces during the South African War, and not the reverse, as previous figures may have led one to suppose.[2]

The ratio of killed to wounded—1 to 4·1—for the total of four actions given in Table II. has an interestingly close resemblance to the estimate made by Longmore, who, when summing up the ratios of killed and wounded in nearly fifty battles and wars up to 1871, wrote; "The mean ratio of the killed to the wounded will be found to be as 1 to 4·1; or, taking the aggregate numbers, the mean ratio of killed to wounded is 1 to 3·77. These ratios give nearly 20 killed and 80 wounded in every 100 casualties; and this, judging from experience gained down to the present time, may be regarded as the approximate average likely to be met with in battles."[3]

Table IV. shows the final disposal of the total wounded in the four actions compared with figures given for the Crimean War.

We have no information as to whether mortally wounded, not dying at once on the field, were returned as "wounded" or "killed" in the Crimea. Owing to the system of medical aid then in force it is not improbable that the majority of such cases were shown as "killed." We do not know, but giving the Crimean figures the benefit of the doubt by assuming that the death-rate of 15·41 per cent included all cases that were hopeless from a surgical point of view when they came under treatment, we find that the South African cases, from the actions specified, dealt with in a similar way give a death-rate of 7·33 per cent. As stated above, the death-rate from wounds for the whole war—22,899 wounded against 11,515 in the Crimea—was 6·76 per cent. The cause of the lower death-rate may lie between improved surgical knowledge and methods, more efficient medical organizations, change in weapons and conditions of fighting, as affecting severity of wounds, and possibly climate. The possible influence exerted by each of these factors is a point for speculative minds.

The relative reduction in the number of cases discharged as permanently unfit after the South African actions is no less remarkable. It is worth noting that while a much higher percentage of men rejoined the

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[1] "Medical and Sanitary Reports from Officers attached to the Japanese Forces in the Field," General Staff, War Office, 1908, p. 305.

[2] In N. Kozlovski's article, translated by Major G. S. McLoughlin, D.S.O., Journal of the Royal Army Medical Corps, vol. xviii, p. 344, the mortality from wounds in the Japanese Army, 1904-1905, is given as 6·58 per cent, and that in the Russian Army as 4·18 per cent.

[3] "Gunshot Injuries," 1877, p. 591.

ranks after those actions, relatively fewer did so direct at the seat of war than in the Crimea. Nearly the whole of the cases sent home from the Crimea were eventually discharged as unfit for further service, but about two-thirds of those sent home from South Africa returned to duty. Was the transfer of such cases to England unavoidable? One of the reasons given for the high rate of invaliding to England was insufficient hospital accommodation at the Cape, and perhaps that factor had a legitimate influence during the early stages of the war.

TABLE IV.—ULTIMATE RESULTS OF WOUNDS INFLICTED.

	Crimea*		Actions at Belmont, Graspan, Modder River and Magersfontein			
			Mortally wounded brought in to field hospitals included in admissions		Mortally wounded brought in to field hospitals excluded from admissions and included in killed	
	No.	Per cent	No.	Per cent	No.	Per cent
Number of wounded admitted into hospital	11,515	—	1,487	—	1,437	—
Died in field hospitals within 48 hours	1,758 (both rows)	15·27	109	7·33	*50*	*3·36*
Died in L. of C. hospitals ..				—	59	4·11
Discharged to duty at seat of war	6,439	55·91	764	51·38	764	53·17
Invalided to England	3,318	28·81	614	41·29†	614	42·72
Died on passage home	13	·11	*Nil*	*Nil*	*Nil*	*Nil*
Died in hospitals in England ..	4	·03	*Nil*	*Nil*	*Nil*	*Nil*
Discharged to duty in England	290	2·52	403	27·10	403	28·04
Discharged from the Service ..	3,011	26·15	211	14·19	211	14·68
Final disposal at seat of war and in England—						
Died	1,775	15·41	109	7·33	59	4·11
Discharged to duty.. ..	6,729	58·44	1,167	78·48	1,167	81·21
Discharged from the Service	3,011	26·15	211	14·19	211	14·68
Total	11,515	100·00	1,487	100·00	1,437	100·00

*Longmore's "Gunshot Injuries," pages 619-620, "formed from information in different parts of the official "Surgical History of the Crimean War."

†Of 22,899 admissions for wounds during the whole South African War, 7,417, or 32·39 per cent., were invalided to England or Colonies. The final disposal of these cases is not known.

Applying the rates per cent in the various categories under "final disposal" in the case of the Crimea to the four South African actions, the actual results in the latter, with respect to the total of 1,487 wounded, represent a gain over the Crimean results of:—

(*a*) One hundred and twenty lives saved.

(*b*) Two hundred and ninety-eight more men returned to duty.

(*c*) One hundred and seventy-eight less men discharged as permanently unfit.

As regards (*c*), 178 men discharged on account of wounds would cost the State approximately £5,000 per annum in wound pensions.[1]

TABLE V.—Showing the Rate of Return to the Field of Men discharged to Duty in South Africa.

	Belmont		Graspan		Modder River		Magersfontein		Totals	
Percentage returned to duty in South Africa of total admissions, excluding those who died within forty-eight hours	46·8		61·1		52·1		54·0		53·2	
	To duty	Per cent	To duty	Per cent	To duty	Per cent	To duty	Per cent	To duty	Per cent
Period in hospital:—										
Under 1 week	12	11·7	7	7·3	31	15·0	38	10·6	88	11·5
Over 1 week and under 1 month..	68	66·0	38	39·6	89	43·0	158	44·1	353	46·2
.. 1 month and under 2 months	17	16·5	23	24·0	71	34·3	117	32·7	228	29·9
,, 2 ,, ,, 3 ,,	3	2·9	6	6·2	15	7·2	41	11·5	65	8·5
.. 3 ,, ,, 4 ,,	—	—	2	2·1	1	·5	4	1·1	7	·9
.. 4 ,, ,, 5 ,,	1	1·0	—	—	—	—	—	—	1	·1
Period undefined	2	1·9	20	20·8	—	—	—	—	22	2·9
Totals	103	100·0	96	100·0	207	103·0	358	100·0	764	100·0

Table V shows the rate of return to the field of men discharged to duty in South Africa.

Of 1,437 admitted during the four battles, *i.e.*, excluding those who died within forty-eight hours, 764, or 53·2 per cent, were returned to duty from hospitals in South Africa. The rate of return is shown in the Table; but if the total returning to the ranks is taken in relation to the total admissions, we find that:—

88, or 6·1 per cent had returned within one week.

441, or 30·7 per cent had returned within one month.

669, or 46·6 per cent had returned within two months.

22, or 1·5 per cent, returned at various periods unknown. These were mostly men of the Naval Brigade, of whom no records are available, but probably 19 of these, or 1·3 per cent., should be added to the above figures as having returned to the field within two months, bringing the total in that period up to 688, or 47·9 per cent of the total admissions.[2]

[1] Calculated from the actual amount paid in wound pensions per annum for four years to 100 average cases taken from the 211 men shown in the Table as discharged from the Service.

Troussaint states that in the Russo-Japanese War 32 per cent of the Japanese wounded and 35 per cent of the Russian wounded had returned to duty in forty days. "La Direction du Service de Santé en Campagne," p 224.

Table VI is introduced to show the relatively high ratio of wounds of the lower extremity in the fights at Graspan and Belmont. In those actions the troops attacked upwards over rough rocky ground against the enemy posted on the top of the kopjes. The number of fractured thighs at the battle of Belmont was quite remarkable. Longmore pointed out that the legs and thighs of soldiers are not infrequently wounded by projectiles which have rebounded from hard ground or stones, and that the number of wounds, which might be expected from an estimate of the superficial area exposed to the direct shots of the enemy, in the lower extremities thus become increased. The only instance mentioned by Longmore in which the ratio of wounds of the lower extremity is higher than that of Graspan and Belmont is in connection with the battle of Tauberbischofsheim, in 1866, where, out of 297 wounds, the lower extremity ratio was 535·3 per 1000. That engagement was fought over ground presenting somewhat similar conditions. On the other hand, Longmore also pointed out the high proportion of wounds of the upper extremity in the New Zealand War and in the Ashanti War, 1873-74, where fighting took place through dense fern or bush which concealed the lower parts of the body. The very high proportion of wounds of the upper extremity, and the small figure for the lower extremity, in the case of Russian Army in Manchuria 1904-05 may be due to the operations of that army having been mostly of a defensive nature in which trenches protected the lower extremities.

TABLE VI.—Table showing Relative Proportion of Wounds of the Principal Regions of the Body.

	Number of wounds specified	Ratio per 1,000			
		Head, face, neck	Trunk	Upper extremity	Lower extremity
Average various wars up to 1870, in which fighting chiefly took place in the open field*	..	117·8	190·6	271·1	420·5
Crimea (British)*	7,525	215·0	153·6	298·6	332·8
New Zealand War*	463	144·7	198·7	343·4	313·2
Sedan (French)*	579	91·5	214·2	253·9	440·4
Belmont	202	153·0	144·0	218·0	485·0
Graspan	144	104·0	132·0	257·0	507·0
Modder River	354	99·0	153·0	318·0	430·0
Magersfontein	578	99·0	149·0	307·0	445·0
Last four actions combined ..	1,276	108·0	148·0	289·0	455·0
Russian Army, Manchuria, 1904-05†	151,944	151·0	175·0	377·0	297·0

* "Gunshot Injuries," Longmore, p. 600,.

† N. Kozlovski: translation by Major G. S. McLoughlin, D.S.O., Journal of the Royal Army Medical Corps, vol. xviii, p. 341.

Table VII shows the number of men admitted to hospital who received one, two, or more wounds and the regional distribution of the

TABLE VII.

Battle	Admitted to hospital	One Wound																		Two or more Wounds, Various Regions		
		Head	Face	Neck	Chest	Abdomen	Back	Shoulder	Arm	Elbow	Forearm	Wrist	Hand	Buttock	Thigh	Knee	Leg	Ankle	Foot	Unclassified	2 wounds	3 wounds	4 or more wounds
Belmont ..	230	12	5	14	18	6	5	6	12	5	9	2	10	14	44	6	17	6	11	—	26	2	—
Graspan ..	163	11	2	2	5	12	2	7	18	2	4	—	6	2	25	5	26	2	13	—	18	1	—
Modder River ..	409	20	7	8	15	19	20	31	35	11	14	2	19	20	39	14	32	10	37	1	49	5	1
Magersfontein ..	685	31	13	13	34	26	26	43	57	6	22	7	42	18	87	19	66	14	53	1	90	16	1
Totals ..	1,487	74	27	37	72	63	53	87	122	24	49	11	77	54	195	44	141	32	114	2	183	24	2
Percentage																							
	1 wound																						
Belmont ..	(202) 87·8	5·9	2·5	6·9	8·9	3·0	2·5	3·0	5·9	2·5	4·5	1·0	4·9	6·9	21·8	3·0	8·4	3·0	5·4	—	11·3	·9	—
Graspan ..	(144) 88·3	7·6	1·4	1·4	3·5	8·3	1·4	4·8	12·5	1·4	2·8	—	4·2	1·4	17·4	3·5	18·0	1·4	9·0	—	11·1	·6	—
Modder River ..	(354) 86·6	5·6	2·0	2·3	4·2	5·4	5·6	8·8	9·9	3·1	4·0	·6	5·4	5·6	11·0	4·0	9·0	2·8	10·4	·3	12·0	1·2	·2
Magersfontein ..	(578) 84·4	5·4	2·2	2·2	5·9	4·5	4·5	7·4	9·9	1·0	3·8	1·2	7·3	3·1	15·1	3·3	11·4	2·4	9·2	·2	13·1	2·3	·2
Totals ..	(1,278) 86·0	5·8	2·1	2·9	5·6	4·9	4·1	6·8	9·6	1·9	3·8	·9	6·0	4·2	15·3	3·4	11·0	2·6	8·9	·2	12·3	1·6	·1

single wounds only. The records do not contain sufficient information to permit of any classification into wounds of soft parts—fractures penetrating and non-penetrating, &c.

Perhaps the most interesting point in the table is the extraordinary similarity in the percentage of one, two, three and four or more wounds in the total to the figures given in the records of the Russian Red Cross Society's Hospital at Port Arthur.[1] Of 1,616 wounded patients treated in that hospital 85·3 per cent received one wound, 11·0 per cent two wounds, 1·9 three, and 1·8 four or more wounds. In the latter category there were patients with eight, nine, twelve, nineteen, twenty-seven and forty wounds.

TABLE VIII.—Sick transferred to the Line of Communication from Lord Methuen's Force during Six Weeks. During the First Four Weeks the Force was Marching and Fighting, and during the Last Two Weeks it was in Camp at Modder River.

Week ending :—	Nov. 24, 1899	Dec. 1, 1899	Dec. 8, 1899	Dec. 15, 1899	Dec. 22, 1899	Dec. 29, 1899
Average weekly strength ..	8,906	9,298	11,752	14,381	14,381	14,381
Total sick transferred during the week	82	89	112	280	33	97
Average daily	11·7	12·7	16·0	40·0	4·7	13·9
Percentage daily loss on total strength	·13	·14	·14	·28	·03	·09

APPENDIX B.

Extracts from Despatches and other Documents relating to the Medical Service and the Wounded of Lord Methuen's Force.

Despatches from Lieutenant-General Lord Methuen, *London Gazette*, January 26, 1900 :—

(1) Engagement at Belmont, November 23, 1899 :—

. . . . By 10.30 p.m. my Division was in camp; by 1 p.m. all my wounded were in a comfortable house being carefully tended; by 5 p.m. next day the hospital train conveyed the less severe cases to Orange River, the graver cases to Cape Town. This is the most perfect work I have ever heard of in war, and reflects the highest credit on Colonel Townsend.

(2) Engagement at Enslin, November 25, 1899 :—

. . . . I again draw attention to the exceptional organizing power of Colonel Townsend at Swinks Pan. At 11.30 p.m. I was informed that owing to all the ambulances having been used for taking

[1] Russo-Japanese War, Medical and Sanitary Reports from officers attached to the Japanese Forces in the Field, General Staff War Office, 1908, p. 281.

the wounded to the train at Belmont, I had scarcely a field hospital mounted officer, only three ambulances and three stretchers. I knew I had to fight next morning, so got together fifty blankets in order to carry wounded with help of rifles. I also sent to Colonel Townsend to make arrangements for wounded by 3 a.m., a messenger having to ride seven miles to him. He met me on the field with full supply of ambulances, and I never saw anything more of him or the wounded, because he had a train ready for them between Graspan and Belmont. His only complaint is that there is not much of his mules left, an observation which applies equally to men and animals.

(3) Action at Modder River:—

(*a*) . . . . Again I call attention to the splendid hospital arrangements, for at 4.45 p.m., on the day after the fight, all my wounded were on their way to Cape Town.

I am glad to have been slightly wounded, because in no other way could I have learnt the care taken of the wounded, and there was nothing officer or private soldier required that was not provided at once, and the medical officers never tired in their endeavour to alleviate suffering.

(*b*) Referring to Colonel A. Paget, commanding the 1st Scots Guards, Lord Methuen's despatch states: "He draws attention to Captain Moores, Royal Army Medical Corps, who, although wounded in the hand, said nothing, but continued his duties."

London Gazette, March 16, 1900: On the action at Magersfontein.

. . . . Major O'Donnell and Lieutenant Delap, Royal Army Medical Corps, were indefatigable in attending wounded under fire.

. . . . Corporal Bartlet, 2nd Battalion Coldstream Guards, under a very heavy fire, went 1,000 yards to get a stretcher for Major Milton.

. . . . Corporal Munro and Lieutenant Hore-Ruthven, of the Black Watch, carried the Marquis of Winchester out of action after he was hit.

. . . . No. 4050 Serjeant McDonald (Highland Light Infantry), gallant behaviour specially brought to notice for carrying messages to guns and to medical officer under heavy fire.

. . . . No. 3113 Corporal Shaul, Highland Light Infantry, brought to notice for several specific cases of bravery when in charge of the stretcher-bearers of the battalion.[1]

. . . . Captain E. B. Towse[2] (Gordon Highlanders), recommended for special reward by his Commanding Officer for his gallantry and devotion in assisting the late Colonel Downman when mortally wounded in the retirement, and when close up to the front of the firing line. He endeavoured to carry Colonel Downman on his back, but finding this not

[1] V.C., *London Gazette*, September 28, 1900.
[2] V.C., *London Gazette*, July 6, 1900.

possible supported him till joined by Colour-Sergeant Nelson' and Lance-Corporal Hodgson. The conduct of these non-commissioned officers is described as admirable.

. . . . Band-Sergeant Hoare (Seaforth Highlanders), conspicuous for his coolness and gallantry during the day in helping Dr. (Lieutenant) Ensor (R.A.M.C.) to succour wounded. Personally carried Captain Fetherstonhaugh (wounded) on his back, some 800 yards, to the dressing station.

. . . . Lieutenant Douglas, Royal Army Medical Corps, showed great gallantry and devotion, under a very severe fire, in advancing in the open and attending to Captain Gordon (Gordon Highlanders), who was wounded; also attending to Major Robinson and other wounded men under a fearful fire.[1]

. . . . Captain A. Campbell, Argyll and Sutherland Highlanders, displayed great coolness throughout the day and helped to dress the wounds of Captain Gordon under a hot fire.

. . . . Private A. Bettington, Cape Mounted Rifles, attached to Cape Medical Corps, and Private Johnson, Argyll and Sutherland Highlanders, were instrumental in removing a wounded Highlander from the front under a heavy fire.

Despatches relating to the Naval Brigade under Lord Methuen's Command, up to the battle of Graspan, forwarded to the Admiralty by Rear-Admiral Sir Robert H. Harris, K.C.M.G., Commanding-in-Chief on the Cape of Good Hope and West Coast of Africa, were published in the *London Gazette* of the March 30, 1900.

Admiral Harris, in forwarding Captain Protheroe's despatch, said:—

"I am glad to say that the wounded officers and men are doing well; most excellent work is being done at the Naval Hospital, the medical officers of which derive great assistance from Mr. Elliott, torpedo gunner, who has the Röntgen apparatus. Captain Protheroe reported to me verbally that Fleet-Surgeon Porter, on the field of Graspan, was well up to the front with his bearers, and did very fine service for the wounded."

Extract from the report by Captain A. E. Marchant, R.M.L.I., who commanded the Naval Brigade at Graspan after Captain Protheroe was wounded:—

"Fleet-Surgeon James Porter, who was with the firing line, and

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[1] Extract from the *London Gazette*, March 29, 1901: "The King has been graciously pleased to signify his intention to confer the decoration of the Victoria Cross on the undermentioned officer, whose claims have been submitted for His Majesty's approval, for his conspicuous bravery in South Africa, as stated against his name:—

"Lieutenant H. E. M. Douglas, Royal Army Medical Corps. On the 11th December, 1899, during the action at Magersfontein, Lieutenant Douglas showed great gallantry and devotion under a very severe fire in advancing in the open and attending to Captain Gordon, Gordon Highlanders, who was wounded, and also attending to Major Robinson and other wounded men under a fearful fire. Many similar acts of devotion and gallantry were performed by Lieutenant Douglas on the same day."

Surgeon Beadnell, with the guns, did excellent service under trying conditions, under fire nearly the whole time."

Extract from the report by Lieutenant F. W. Dean, R.N., who commanded the Naval guns on the left flank at Graspan :—

"On Friday night I found Surgeon Beadnell at Belmont Station; he had been invalided by a Medical Board that day and was waiting for the hospital train. Though in bad health he gladly accepted my order to remain with the guns in view of the pending engagement, and on Saturday he rendered invaluable aid to our wounded, working close up to the guns, where shrapnel balls were showering every other minute.

The Report of the Royal Commission, presided over by Lord Justice The Right Honourable Sir Robert Romer, appointed to consider and report upon the care and treatment of the sick and wounded during the South African Campaign, referring to Lord Methuen's advance, pp. 19 and 20 states :—

" . . . It appears from the evidence of Surgeon-General Wilson that Lord Methuen's force was accompanied by the full complement of bearer companies and field hospitals, each with a complete equipment."

" . . . The manner in which the wounded were tended on the field and removed by the bearer companies was considered by the witnesses who gave information on this point to have been particularly good, and great credit is given to the Medical Officers attached to Lord Methuen's column."

" . . . On the whole we consider that the medical arrangements in connection with this advance were well devised and well carried out. There seems, however, to have been some delay in establishing stationary hospitals at Orange River and at Modder River. This was probably due to the fact that these hospitals had to be organized in South Africa. Still, there does not seem to have been any considerable degree of pressure, as, owing to the excellent service of the hospital and other trains, and the free power of evacuation which they afforded, the field hospitals were never during this advance used for purposes for which they were not intended. In this respect, Lord Methuen's advance had a great advantage over that of Lord Roberts, which, during the greater part of it, had no line of railway as a communication with the base, and where, accordingly, the field hospitals were of necessity for considerable periods used as fixed hospitals."

The German official account of the War in South Africa prepared in the Historical Section of the Great General Staff, Berlin, in commenting on the battle of Magersfontein, p. 120, says :—

"The splendid services of the Royal Army Medical Corps still remain to be noticed; the officers, non-commissioned officers, and bearers had traversed repeatedly, with the greatest coolness, the fire-swept zone, which was nearly a mile in depth. On December 11 they brought in, partly from the firing line, 500 wounded, dressed their wounds, and

brought them down to Modder River Station, whence they were evacuated by rail to Cape Town. In some isolated instances wounded men remained unseen in the bush, or lay helpless for more than twenty-four hours close in front of the Boer trenches, but the bearer companies were not to blame on this account, as the wounded in question had either not been noticed or else they were too far removed from help. Nor was it only in the British ranks that these men gave their services, for they did the same when asked by the enemy for aid."

Colonel Nicholas Senn, M.D., Ph.D., LL.D., Surgeon-General of Illinois, Chief of the Operating Staff with the Army in the Field during the Spanish-American War, Professor of Surgery, Rush Medical College, in a paper on the "First Dressing on the Battlefield," presented to the Military section of the Madrid International Medical Congress, p. 352, Volume xiii, *Journal of the Association of Military Surgeons, U.S.A.*, said: "At Magersfontein five hundred wounded were dressed on the field and transported to the rear during the heat of battle, exposed at a distance of a mile to the fire of the enemy, with results that will always be a credit to the Medical Service of the British Army."

The Officers of the German Army Medical Service who had been attached to the Guards Field Hospital wrote, on February 20, 1900, to Surgeon-Lieutenant-Colonel Magill:—

"As we are about to leave this country, going home, we would like, for the present, to say good-bye to you and once more to thank you for all the kindness you have shown us. If our stay there has been a profitable and a pleasant one, this is due to the spirit of good comradeship with which the English Medical Officers have on every instance received us.

"But most of all it came out in the time of closer intercourse that we spent attached to your hospital, which we shall always cherish as one of the most interesting and pleasant periods we spent out here.

"We wish that the Royal Army Medical Corps may further on show itself the efficient and well-organized Corps it has proved itself up to now, and for which we offer our most hearty congratulations."

APPENDIX C.

STAFF AND REGIMENTAL UNITS UNDER THE COMMAND OF LIEUTENANT-GENERAL LORD METHUEN, K.C.V.O., C.B., C.M.G., DURING THE ADVANCE ON KIMBERLEY, BETWEEN NOVEMBER 21 AND DECEMBER 12, 1899, WITH THE NAMES OF MEDICAL OFFICERS ATTACHED OR ALLOTTED.

Head-Quarters First Division First Army Corps	Colonel E. Townsend, C.B. (1), P.M.O. Major C. H. Burtchaell, Medical Officer and Secretary to P.M.O.
Naval Brigade. (Captain R. C. Protheroe, R.N., wounded at Graspan, and replaced by Captain Bearcroft, R.N.)	Fleet-Surgeon J. Porter, H.M.S. "Doris" (2). Surgeon C. M. Beadnell, H.M.S. "Powerful" (3). Surgeon E.P. Mourilyan, H.M.S. "Doris" (4).

Mounted Troops.	
9th Lancers	Captain J. V. Forrest.*
12th Lancers	Major T. J. O'Donnell† (5).
G. Battery R.H.A.	Lieutenant G. G. Delap.*†
Mounted Infantry (Northumberland Fusiliers Loyal N. Lancs Regt. and King's Own Yorks Lt. Inf.)	Lieutenant R. S. Rodger (6) (replaced by Lieutenant J. E. Hodgson at Modder River).
New South Wales Lancers	
Rimington's Guides	
Royal Field Artillery.	
Brgde. Div. R.F.A. (Lt.-Col. F. H. Hall)	
18th, 62nd, 75th Field Batteries	Major H. L. Battersby (7).
65th (Howitzer) Battery	
Royal Engineers.	
(Lieut.-Colonel J. B. Sharpe)	
7th and 11th Field Companies	Lieutenant A. Chopping.*
8th Railway Company	
30th Fortress Company	
Field Hospital Divisional Troops.	
No. 3 Field Hospital (No. 8 Company R.A.M.C., N.E. District, York)	Major S. C. B. Robinson (8).
	,, H. J. Peard (9).
	Lieutenant N. J. C. Rutherford.*
	,, H. D. Packer.*
	Qmr. and Hon. Lt. J. C. B. Whitehorn (10).

1st (*Guards*) *Brigade.*
(Major-General Sir H. E. Colvile, K.C.M.G., C.B.).

3rd Batt. Grenadier Guards	Captain C. W. Profeit.*
1st Batt. Coldstream Guards	,, A. W. Hooper.*†
2nd Batt. Coldstream Guards	,, A. F. Heaton (11).
1st Batt. Scots Guards	,, S. G. Moores (12).
No. 1 Bearer Company.	
18th Company R.A.M.C. Home District	Major H. J. R. Moberly (13).
	Captain T. B. Beach (14).
	Lieutenant J. E. Hodgson.* (Replaced at Modder River by Civil Surgeon J. G. Croghan).
No. 1 Field Hospital.	
18th Company R.A.M.C. Home District	Surg. Lt.-Col. J. Magill (15), Cold. Guards.
	Surg.-Major E. N. Sheldrake (16), Gren. Gds.
	,, W. R. Crooke Lawless (17), Coldstream Guards.
	,, W. C. Beevor (18), Scots Gds.
	Qmr. and Hon. Captain T. Phillips (19).
	Attached during action at Magersfontein :—
	Stabsarzt Dr. Schmidt, Royal Prussian Guarde—Füsilier Regiment.
	Stabsarzt Dr. Krummacher, Kaiser Wilhelm Academie.

3rd (*Highland*) *Brigade.*
Major-General A. G. Wauchope, C.B., C.M.G.

2nd Batt. R. Highlanders	Lieutenant H. E. M. Douglas*† (20).
1st Batt. Highland L.I.	,, T. C. Mackenzie.*†
2nd Batt. Seaforth Highlanders	,, H. Ensor.*†
1st Batt. Argyll and Sutherland Highlndrs.	Captain J. E. Carter.* (21)
1st Batt. Gordon Highlanders	,, P. J. Probyn.*†
Bearer Company.	
"A" Company Cape Medical Staff Corps	Lieut.-Col. E. B. Hartley, V.C. (22) (Cape M. Rifles).
	Lieutenant Spencer, C.M.S.C.
	,, Temple Smyth, C.M.S.C.
	Qmr. M. Varder, C.M.S.C.

Field Hospital.	
No. 3 Company R.A.M.C., Aldershot (mobilised as Divisional Field Hospital, 2nd Division)	Major H. W. Murray (8). ,, G. Coutts (7). Lieutenant G. H. Goddard* (21). ,, R. A. Cunningham.* Qmr. and Hon. Lt. A. Finlay (23).

9th Infantry Brigade.
(Major-General R. S. R. Fetherstonhaugh wounded at Belmont and replaced by Major-General R. Pole-Carew).

1st Batt. Northumberland Fusiliers	Captain D. D. Shanahan* (24).
Half Batt. 1st Loyal N. Lanc. Regiment	Lieutenant W. Jagger (25).
2nd Batt. Northamptonshire Regiment	,, E. L. Munn (26).
2nd Batt. King's Own Yorkshire Light Infantry (2 Coys. Royal Munster Fusiliers attached at Belmont)	Captain G. B. Crisp.*
No. 3 Bearer Company.	
No. 1 Company R.A.M.C., Aldershot, (mobilised as the 3rd Highland Brigade Bearer Company)	Major R. G. Hanley (27). Captain C. W. R. Healey (28). Lieutenant M. H. G. Fell.*
No. 7 Field Hospital.	
No. 19 Company R.A.M.C., Chester (mobilised as Divisional Field Hospital, 1st Division).	Major F. A. Harris (29). ,, R. P. Bond (7). Captain J. C. Jameson.* Qmr. and Hon. Lt. J. W. H. Beach (30).

* Now Major. † D.S.O.

(1) Now Surgeon-General Sir E. Townsend, K.C.B., C.M.G., retired pay.
(2) Now Surgeon-General (with the relative rank of Vice-Admiral) Sir J. Porter, K.C.B., K.H.P., Director-General of the Medical Department of the Navy.
(3) Now Fleet-Surgeon.
(4) Now Deputy Inspector-General of Hospitals, retired list.
(5) Now Colonel, Assistant Director Medical Service, Tidworth.
(6) Afterwards Captain, Reserve of Officers.
(7) Now Lieutenant-Colonel, Retired pay.
(8) Now Colonel, retired pay.
(9) Afterwards Lieutenant-Colonel, died at Middleburg, Cape Colony, August 18, 1903.
(10) Now Honorary Captain, retired.
(11) Now Captain, Reserve of Officers, Royal Army Medical Corps.
(12) { Promoted Major for distinguished service. Now Lieutenant-Colonel. Wounded at Modder River November 28, 1899.
(13) Afterwards Colonel. Died in London February 9, 1912, when on retired pay.
(14) { Promoted Major for distinguished service. Now Lieutenant-Colonel.
(15) Now Colonel, C.B., retired pay.
(16) Now Surgeon Lieutenant-Colonel, Reserve of Officers, Grenadier Guards.
(17) Now Surgeon Lieutenant-Colonel Sir W. R. Crooke Lawless, Kt., C.I.E. Reserve of Officers, Coldstream Guards.
(18) Now Lieutenant-Colonel, C.M.G., Royal Army Medical Corps.
(19) Now Honorary Major, retired pay.
(20) V.C. Wounded at Magersfontein December 11, 1899.
(21) Severely wounded at Paardeburg February 18, 1900.
(22) Now Colonel, retired, late Principal Medical Officer Cape Colony Forces.
(23) Afterwards Honorary Captain. Died at Perth, Western Australia, on April 20, 1910.
(24) { Promoted Brevet-Major for distinguished service. Severely wounded near Kleinfontein October 24, 1901.
(25) Afterwards Captain. Resigned his Commission November 22, 1902.
(26) Wounded at Belmont November 23, 1899. Died at Boshof, Orange Free State, May 23, 1900.
(27) Afterwards Lieutenant-Colonel. Died at Bloemfontein, January 29, 1912.
(28) { Promoted Major for distinguished service. Now Lieutenant-Colonel.
(29) Afterwards Lieutenant-Colonel. Died at Bletchingley, Surrey, September 27, 1906.
(30) Now Honorary Major.

Clinical and other Notes.

SALVARSAN IN THE TREATMENT OF SYPHILIS.

By Major E. T. INKSON, V.C.
Royal Army Medical Corps.
AND
Captain J. J. HARPER NELSON.
Indian Medical Service.

Since the introduction of salvarsan as a remedy in the treatment of syphilis by Professor Ehrlich, a great deal has been written both for and against the use of this drug, and, having used it on a small scale, we venture to publish the following notes as to our experience of its utility.

We have treated eighteen cases of undoubted syphilis with salvarsan, adopting the intravenous method of administration as advocated in the Journal of the Royal Army Medical Corps of April, 1911. Our cases have varied in intensity from early infectious, with a primary Hunterian sore, to late tertiary conditions. Some of the cases have had one or more courses of mercury; others have had only salvarsan. The brief notes appended will explain the nature of the cases treated and the results obtained.

We may say that the intramuscular method of administering the drug was first used by us, but proved unsatisfactory, and we abandoned it. We have not included the cases treated in this way in our present series, unless they have subsequently had an intravenous injection of the drug.

Like others we have found that the intramuscular method of medication is very liable to be followed by the formation of localized ulcerations some considerable time after the injection of the drug. In some cases these localized areas have had to be removed by operation before healing was effected, and we found that they consisted of dense tissue in which was embedded a greyish-black powder giving the reactions of an arsenical salt (*vide* Case 1).

The effects following the intravenous injection of salvarsan may be best understood by considering the immediate and after results obtained.

(*a*) *Immediate Effects.*—In all cases the injection was made into one of the veins of the forearm, preferably the median basilic. The injection took on an average about eleven minutes to perform. In no case did any of our patients complain of any discomfort or feeling of oppression during the operation. They were all at once put to bed and made to remain quiet.

(*b*) *After Effects.*—These varied somewhat in rapidity of onset and intensity, but in all cases there was a general resemblance in the effects

produced. The patients first complained of a feeling of chilliness. The temperature then began to rise, in some cases being preceded by a distinct rigor, going up to over 100° F., and in one case reaching 105° F. (*vide* Case 9). The rise of temperature was accompanied by a feeling of nausea, and sometimes by vomiting. The pulse became very rapid in rate, in several cases reaching 150 beats per minute, but remained regular in rhythm, though feeble. In one or two cases there was also slight diarrhœa.

In a few hours, usually four or five, these effects began to pass off. The patients sweated, and by night they were, in most cases, feeling fairly comfortable. In twenty-four hours most of them had quite returned to their normal condition again. In one case (Case 12) vomiting persisted for forty-eight hours.

An interesting feature noted was that in nine of the cases a well-marked herpes labialis developed in from two to three days after the injection. Attempts were made to cultivate organisms from the vesicles, but in no case were any obtained. The herpes was indistinguishable from ordinary herpes frontalis or zoster in type, and followed the distribution of cutaneous nerves round the mouth and chin. The condition was undoubtedly similar to that referred to by Sir Jonathan Hutchinson, F.R.S., in the *British Medical Journal* of April 29, 1911.

In all our cases the Wassermann reaction has been carefully carried out before and after administering salvarsan.

The following are brief synopses of the notes of the eighteen cases treated :—

Case 1.—Private S., admitted June 8, 1911, suffering from a copious purulent discharge from the nose, pain over left orbit, conjunctivitis of both eyes, with accompanying iritis of the left eye. Had had five complete courses of mercury. (In March, 1911, he was given two intramuscular injections of "606" in the subscapular regions. In May he developed two hard lumps at the sites of the injections, which broke down and would not heal. They were eventually removed by operation, when healing took place.) June 9 : 0·5 grm. of salvarsan administered intravenously. June 10 : Conjunctivitis and iritis already show marked improvement, and the nasal discharge is much reduced. June 12 : Eye trouble has quite disappeared and patient can now tolerate a strong light. June 17 : Eyes quite normal. There is still some discharge from the nose, but much less offensive, and some frontal headache. June 23 : 0·2 grm. salvarsan injected intravenously. June 25 : Patient states he feels perfectly well. Eyes normal. No headache. Nasal discharge ceased. Patient was discharged from hospital. September 7 : Has been frequently seen since June 25. Has had no further symptoms, and increased 15 lb. in weight. Wassermann reaction : Positive on June 8, July 7, and on September 9.

Case 2.—Private W., admitted May 8, 1911. Condition on June 8 :

Had a large deep ulcer on right tonsil with wash-leather slough; also some stomatitis. Very weak and markedly anæmic. Had had two complete courses of mercury. June 9: 0·5 grm. of salvarsan was given intravenously. June 11: Slough separating from right tonsil. June 15: Ulcer almost healed. June 21: 0·2 grm. of salvarsan injected into vein of right arm. June 28: Discharged to attend hospital; throat normal. Has gained 8 lb. in weight since first injection on June 9. September 7: Seen frequently since being discharged to duty. Has had no active signs of syphilis since, and is looking very well. Wassermann reaction: Positive on May 7 and June 8; negative on September 7.

Case 3.—Corporal B., admitted on June 10, 1911, suffering from mucous patches on inside of cheeks and lips. There is extensive ulceration of back of throat with a large slough. June 12: 0·5 grm. of salvarsan injected intravenously. June 14: Throat improving and slough beginning to come away. June 23: Throat quite normal, and no other active signs of syphilis present. Discharged from hospital. July 15: Left Bangalore, looking and feeling well. Wassermann reaction: Positive on June 9 and on July 10.

Case 4.—Private J., admitted June 11, 1911, with a gummatous ulcer on dorsum of right foot and also an ulcer on soft palate. Had completed three courses of mercury. June 12: 0·5 grm. of salvarsan injected. June 14: Ulcer on palate much improved and gumma on foot rapidly healing. June 21: Palate normal; gumma healed. Discharged to attend hospital. September 9: Seen to-day and is quite well. Wassermann reaction: Positive, June 10 and on July 9; feebly positive, September 10.

Case 5.—Private M., admitted June 9, 1911. Extensive ulceration of both tonsils, and deep ulceration of soft palate, which had perforated. Has difficulty in swallowing, which is also painful; he is much run down. He had had four complete courses of mercury and was struck off the syphilis register on October 29, 1908, having had most of his treatment in England. June 10: 0·5 grm. of salvarsan injected. June 13: Throat much improved, sloughs have come away, leaving clean ulcers. June 19: Tonsils normal. Perforation of soft palate has healed edges. Discharged hospital. September 9: Seen to-day, throat normal. The soft palate is permanently destroyed in front but looks healthy. Wassermann reaction: Positive, June 9, July 10 and September 9.

Case 6.—Private M., admitted June 11, 1911. Ulceration of both tonsils, mucous patches on tongue, palate and inside cheeks. Has had three courses of mercury and was under observation. June 12: 0·4 grm. of salvarsan injected, June 16: Throat improving rapidly, mucous patches have disappeared. June 18: Throat normal, no active signs of disease anywhere. Discharged hospital. September 9: Seen at frequent intervals since and has had no further signs of syphilis. Wassermann reaction: Positive June 10; negative July 10 and September 9.

Case 7.—Private J., admitted June 12, 1911. Ulceration of both tonsils and fauces with considerable œdema of parts. Had completed his fourth course of mercury and was under observation. June 13: 0·5 grm. salvarsan injected. June 16: Both tonsils are rapidly getting better. June 20: Throat normal. Discharged to attend. September 11: Throat quite normal. No active signs of syphilis. Wassermann reaction: Positive, June 10, July 9, and on September 9.

Case 8.—Private H., admitted May 28, 1911. Well-marked secondary rash on face, trunk and limbs, congestion of fauces and shotty inguinal glands; weight 8 st. 2 lb. June 9: 0·5 grm. salvarsan injected. June 11: Rash beginning to fade. June 24: Rash disappeared except for a little on chest. Throat is normal; gaining weight. July 15: 0·3 grm. salvarsan injected. July 19: All symptoms have entirely disappeared. Discharged to attend hospital; has gained 1 st. 4 lb. in weight since admission. September 9: Has been seen frequently since being discharged from hospital, but has had no further signs of syphilis. Wassermann reaction: Positive May 29, 1911, and July 19; negative September 9.

Case 9.—Private C., admitted June 22, 1911. Ulceration of both tonsils and fauces affected. Has had three courses of mercury and was under observation. June 23: 0·5 grm. of salvarsan injected. Had a very severe reaction, his temperature running up to 105° F. June 24: temperature normal; complains of headache. June 28: Throat rapidly improving. June 30: Throat normal. Discharged to attend. July 26: Left Bangalore. Quite well on departure. Wassermann reaction: Positive June 22 and July 2.

Case 10.—Private M., admitted July 6, 1911: When placed on the syphilis register in Bangalore he had a perforation of the soft palate and was also suffering from a very offensive discharge from the nose. Pieces of dead bone came away from time to time. Had had four complete courses of mercury. July 7: 0·5 grm. salvarsan injected. July 9: Discharge from nose much diminished and less offensive. July 12: Nasal discharge only slight. Discharged from hospital to attend. August 4: 0·2 grm. salvarsan injected owing to persistence of slight discharge. August 6: Feels well, slight muco-purulent discharge still coming away. September 5: 0·3 grm. salvarsan injected. September 9: Nasal discharge practically gone and patient is feeling well and has much improved in general health. Discharged to attend hospital. Wassermann: Positive on several occasions.

Case 11.—Private D., admitted July 6, 1911. Typical Hunterian chancre on penis and later developed a macular rash diffused over trunk and limbs with severe ulceration of right tonsil. Evening temperature ranging from 100° to 102° F. General constitutional symptoms severe. July 20: 0·4 grm. salvarsan given. Had had no mercury. July 21: Temperature 99° F. Feels much better but complains of slight frontal headache. July 22: Slough has quite separated from right tonsil. Sore

on penis improving. July 27: Marked improvement noticeable. Throat normal, ulcer on tonsil quite healed. Rash on body has disappeared but is still faintly discernible on lower extremities. Sore on penis, which on admission was very large, rapidly healing. Since receiving the injection of salvarsan his temperature has remained normal. August 3: Sore on penis has quite healed. Throat is normal. Rash on lower extremities has faded. August 4: A second injection of 0·4 grm. salvarsan given. August 9: Discharged hospital. Has no active signs. September 9: Seen weekly since but has shown no active signs of syphilis. In good health. Wassermann reaction: Positive July 18 and August 19; feebly positive September 9.

Case 12.—Gunner P., admitted August 16, 1911, suffering from gonorrhœa and two sores on his penis, one of which is a typical hard chancre. Has developed a diffuse macular rash over body and limbs. August 17: 0·3 grm. salvarsan injected. August 18: Has had severe and persistent vomiting since his injection; temperature normal. August 19: Vomiting still threatens. August 20: Vomiting ceased. Rash beginning to fade. August 28: Rash completely disappeared but slight staining remains. September 1: All active signs of disease have disappeared. Discharged to attend hospital. September 9: No active signs of syphilis. Wassermann reaction: Positive August 17 and September 9.

Case 13.—Private D., admitted August 22, 1911. Ulceration of both tonsils. Has had three courses of mercury and is under observation. August 23: 0·3 grm. salvarsan injected. August 25: Sloughs on both tonsils have separated. August 27: Throat quite normal. Discharged to attend. September 11: Seen weekly. No active signs of disease. Wassermann reaction: Positive July 20 and September 11.

Case 14.—Private B., admitted August 27, 1911. Ulceration of tonsils, the left one having a large slough. Had completed three courses of mercury and was under observation. August 28: 0·3 grm. salvarsan injected. August 30: Slough on left tonsil has separated and throat is rapidly improving. September 2: Discharged hospital to attend. Throat normal. Wassermann reaction: Positive August 27.

Case 15.—Private D., admitted August 28, 1911. Suffering from a typical secondary ulcer on calf of left leg about the size of a shilling. Another smaller ulcer on right instep. He had had one course of mercury, and was under observation. August 29: 0·3 grm. salvarsan injected. August 31: Ulcer on left leg beginning to heal. September 2: Both ulcers healing rapidly. September 9: Both ulcers healed. Wassermann reaction: Positive August 28 and September 10.

Case 16.—Gunner E., admitted August 22, 1911. This man was struck off the register on September 29, 1910. On admission he had very typical tertiary ulcers on both legs, six on right and five on left. August 23: 0·4 grm. salvarsan injected. August 25: All sloughs have separated from

ulcers, which are assuming a healthy appearance. September 1: Ulcers on right leg have all healed, but two still remain on left. September 6: 0·3 grm. salvarsan given. September 8: All ulcers, except a small one, healed. Wassermann reaction: Positive August 22 and September 11.

Case 17.—Private E., admitted September 4, 1911. Has ulceration of both tonsils. He had been struck off the syphilis register in June, 1911. September 5: 0·3 grm. salvarsan injected. September 7: Throat is clearing up remarkably quickly. September 9: Throat normal. Discharged to attend. Wassermann reaction: Positive September 4.

Case 18.—Private G., admitted September 4, 1911. Ulceration of both tonsils. Had completed four courses of mercury and was under observation. September 5: 0·3 grm. salvarsan injected. September 7: Throat rapidly improving. September 9: Throat quite normal. Discharged to attend. Wassermann reaction: Positive September 4.

We are of the opinion that every one of these eighteen cases has improved as a result of the intravenous administration of salvarsan. The active signs of disease have disappeared in a wonderfully short time and the men have improved in general health and been able to return to work and carry on their duties. The results have been particularly good in throat lesions.

Our thanks are due to Assistant Surgeon C. A. Wells and H. C. Berlie, of the Indian Subordinate Medical Department, for their help in keeping the notes of the various cases.

SHORT SUMMARY OF THE WORK AT THE "LOUISE MARGARET HOSPITAL," ALDERSHOT, DURING THE YEAR 1911, WITH NOTES AND REMARKS ON THE MOST IMPORTANT CASES.

By Major S. F. St. D. GREEN.
Royal Army Medical Corps.

I.—Number of maternity cases admitted, 510; of these, 173 were primiparæ, 337 were multiparæ.

There were 500 vertex presentation, 13 breech, 3 transverse, and 1 Cæsarean section.

The total number of infants was 517, including the "Cæsarean baby," 7 sets of twins, and the still-births, of which there were 14.

The above cases included: 12 persistent occipito-posterior cases, 18 premature births, 4 cases of adherent placenta, 4 of placenta prævia, 4 of induction of labour, 3 in which forceps had to be applied, 4 in which version was performed, 1 case of albuminuria.

The Cæsarean section was performed on account of a large fibroid of the lower segment of the uterus.

Supra-vaginal hysterectomy was also performed in this case. This operation is noted with particulars in the following list of operations.

Two deaths occurred among the maternity patients; and in each case death was the result of severe hæmorrhage and shock caused by placenta prævia. One of these women was suffering from heart disease, and the other had lost a good deal of blood before coming to hospital.

II.—The number of cases admitted for general diseases was 704—i.e., 261 women and 443 children.

The total number of admissions during the year, including both maternity and general cases, was 1,214.

III.—The number of women and children who attended as out-patients on Tuesdays for extraction of teeth was 178; of these 114 had nitrous oxide gas.

IV.—The number of attendances of women as special gynæcological out-patients on Thursdays was 508.

V.—The number of major and minor surgical operations performed during the year was 456, of which 3 died (all three being late cases of appendicitis—see below).

These operations included 90 abdominal operations, and 366 miscellaneous operations; of which the following is a list:—

(*A*) Abdominal Operations.

(I) *Excision of the Vermiform Appendix* (for appendicitis).—Twenty-seven cases; 24 successful, 3 died.

The three fatal cases were all very late ones (children) and died of severe toxæmia:—

Case 1.—Died two days after the operation, and had very enlarged mesenteric glands, a gangrenous appendix, and fæcal abscess.

Case 2.—Arrived in hospital on the fifth day of illness in an advanced state of toxæmia, and had to be brought in several miles from the country. She was operated on immediately after admission, and found to have a perforation of the appendix, fæcal concretion, and a foul fæcal abscess. This child died on the day following the operation.

Case 3 was operated on immediately after admission to hospital on the third day of illness, and died twelve hours afterwards. She was found to have a gangrenous appendix, fæcal concretion, perforation, and pus.

Of the remaining 24 cases, in 8 the appendix contained fæcal concretions; in 7 it contained threadworms; in 2 it was kinked and surrounded by adhesions; in 2 it was gangrenous; in 2 there was perforation and abscess; in 1 the mucous membrane was ulcerated; in 1 there were adhesions round the appendix, and tubercular calcareous mesenteric glands in the neighbourhood; and in 1 the appendix was doubled back on itself, and closely bound down along its whole length to the cæcum, the distal end being close to the liver.

In this case the patient, a very stout woman, aged 40, had suffered pain of a colicky nature at intervals for twenty years. The pain was very like that of biliary colic, and indeed had frequently been mistaken for that; it had become so unbearable (and, according to the patient's statement, so severe that morphia had to be given in some of the attacks) that an exploratory laparotomy was decided on. I first of all made a high incision over the rectus muscle, drawing the latter aside so as to explore the gall-bladder and ducts; but finding nothing there to account for the pain I extended the incision downwards, when adhesions and the above-mentioned position of the appendix were discovered. The appendix was then dissected off the cæcum. The patient made a rapid recovery.

Of the above cases I think the following should be specially mentioned :—

(*a*) An interesting case of a little girl, only fourteen months old, who was suffering from very acute appendicitis accompanied by profuse melæna (a most rare complication of appendicitis). The appendix was gangrenous and contained a very large fæcal concretion as long and thick as a large date-stone.

The following is a short history of the case :—

The child's parents first noticed that she was "out of sorts" on April 14 (Good Friday), the child being fretful during the day. On the same evening she vomited, and after that was unable to retain any food in the stomach. The parents, however, did not send for medical advice until about 4 o'clock the next afternoon (Saturday, April 15), and they then sent for the Orderly Medical Officer because she had passed several ounces of blood by the bowel. Between 5 and 6 o'clock she became rapidly worse, the abdomen becoming much distended and tympanitic, and the pulse very rapid and weak. She was immediately sent to the Louise Margaret Hospital, where she arrived at 6.30 p.m.; her pulse was then 120 and weak, and respirations 34; temperature 99·2° F. At first it was naturally thought that the case was one of very acute intussusception, on account of the profuse hæmorrhage from the bowel and abdominal distension and tenderness, especially as a small, hard mass was felt to the right of and a little above the level of the umbilicus (this mass turned out to be thickened omentum, tucked up and adherent to the abdominal wall).

I performed laparotomy at 7.15 (three-quarters of an hour after admission to hospital); the abdomen was opened in the middle line below the umbilicus; the parietal peritoneum was found to be considerably thickened, and there was a good deal of general peritonitis with fresh bands of adhesions running in different directions, binding the transverse colon to the abdominal wall, the great omentum having been drawn up (as stated above). The small intestine was collapsed and empty, while

the large bowel contained a good deal of dark blood which gave the colon a dark and distended appearance.

After separating the adhesions of the intestines, which was easily done on account of their fresh formation, the vermiform appendix was found bound down in Douglas's pouch. The appendix was 3½ in. long, and thicker than a man's little finger (very large for so small a child); it was angrily inflamed and studded with a number of small, red, inflamed nodules. The extremity was covered with freshly-organized yellow lymph. There were also large inflammatory masses in different parts of the mesentery.

I removed the vermiform appendix, and after breaking down all the bands of adhesions I could find, I closed the abdominal wall layer by layer. On opening up the appendix after removal, it was found to contain at its distal end a long, hard, fæcal concretion, 1 in. long, like a date-stone.

Immediately after the child was taken back to the ward after the operation, she passed several ounces of dark blood from the rectum into the napkins; also on the next day two napkins were soiled with blood, two or three ounces in each; but after this no further hæmorrhage occurred. For the first eight days after the operation the child suffered from pneumonia, but in spite of this and a stitch abscess she made a steady recovery. The stitches were removed on the sixth day.

This child was brought to see me on November 23 (over eight months after the operation), and she was then looking very robust, with rosy cheeks and in the best of health and spirits.

The interesting points about this case were: (1) The copious melæna; (2) rapid onset of the symptoms; (3) the similarity of its clinical symptoms to those of intussusception; (4) the large size of fæcal concretion in a child so small; (5) the wide extent of fresh adhesions with tucking up of the great omentum, and adhesions of transverse colon to abdominal parietes in front.

The hæmorrhage from the bowel was of course due to the intensity of the congestion and inflammation. There was no sign of purpura.

(*b*) I wish also to draw attention to the number of cases in which threadworms were found in the vermiform appendix, viz., 7 out of 27 cases (i.e., in over a quarter of the cases).

In text-books little stress is laid on the part played by threadworms in the causation of appendicitis; and yet this is probably a very important and frequent cause, if not of actual inflammation of the appendix, at any rate of appendicular colic, which is often very severe. In some of these threadworm cases no naked-eye inflammation of the mucous membrane of the appendix could be seen; while in others there was distinct ulceration of the mucous membrane at the site occupied by the threadworms. In the former case there may be no fever at all.

I shall only give the notes of two of these "threadworm" cases :—

Case 1.—Girl, aged 10 years 7 months, admitted into hospital on April 12, 1911.

History of Case.—For twelve months before admission to hospital, this child had suffered from very severe attacks of abdominal pain, confined to the right iliac region; and on various occasions she had been sent home from school on account of the severity of the pains. On admission to hospital, her temperature was *normal* and there was no marked increase of pulse rate. She had slight abdominal pain; and, on being asked to point with the tip of the finger to the site of the pain, she pointed directly to McBurney's point. At this spot, too, she had some very slightly increased muscular resistance, while the rest of the abdomen was quite lax. She had had no attacks of vomiting.

I removed the vermiform appendix on April 17, 1911. This organ was very long and contained a number of threadworms in the distal end; externally the appendix had a normal appearance, except that the extremity was clubbed.

This patient made an uninterrupted recovery, and seven months after the operation the mother informed me that her daughter had had no return of pain since the operation, and was very well.

Case 2.—Girl, aged 12 (an officer's daughter).

History of Case.—For three weeks before the operation this girl had been suffering on and off from lassitude, headache, dirty tongue and pain in the abdomen, the pain being felt chiefly in the right iliac region and across the abdomen, at the level of the umbilicus. The pain was sometimes so bad that it prevented her from walking. At times there was rigidity and tenderness on palpation in the right iliac region. She apparently never had fever and her pulse was normal.

As the parents were anxious for another opinion, I sent the patient to an eminent London surgeon, who agreed with my diagnosis that the trouble was connected with the vermiform appendix.

On May 24 the patient was put under an anæsthetic and I removed the vermiform appendix. This organ was fairly large, clubbed at the extremity, and slightly kinked in the middle by a short mesentery, and contained a few threadworms near its distal end. She made an uneventful recovery, and inquiries several months afterwards showed that she had had no return of pain.

In these operations for appendicitis I always make the incision over the rectus muscle, drawing the latter inwards after opening the sheath. The technique is that employed in all abdominal operations here; that is to say, there is no previous preparation of the skin, except that the patient is given a hot bath. Just before the operation the skin is painted over a wide area with the following solution:—

Liquor iodid. fort.	2 parts
Rectified spirit	3 ,,
Distilled water	3 ,,

This solution is also painted over the skin sutures immediately after the operation, and again before taking the stitches out—on the sixth day in the case of children, and on the eighth day in the case of adults.

In addition to the above twenty-seven cases of appendicitis, the vermiform appendix was also removed in the case of eight other abdominal operations for the conditions mentioned below, viz.:—

(1) In three cases of inguinal hernia in which the appendix formed one of the contents of the sac.

(2) In five cases of removal of Fallopian tubes and ovaries, in some of which it was found involved in the adhesions; while in the others it was found in an unhealthy condition and it was not thought advisable to leave it.

(II) *Cæsarean Section:* One case, successful.

This was an interesting case operated on by Captain Ryan. The patient was the wife of a civil subordinate, aged 34. She was admitted on August 9, suffering from labour pains. On examination through the os, a tumour could be felt completely obstructing the passage of the head. Cæsarean section was performed and as soon as the child had been delivered it was found that there was a large interstitial fibroid (larger than a fœtal head) in the lower segment of the uterus; supra-vaginal hysterectomy had therefore to be performed. The mother made an excellent recovery and the child did well. The stitches were removed on the ninth day after operation.

In addition to this I performed another operation for Cæsarean section, with supra-vaginal hysterectomy, on a civilian in the civil hospital, which is therefore not included officially in this list of operations. Both mother and child did well. The stitches were removed on the eighth day.

This woman was suffering from old tubercular disease of the right hip-joint and had a high degree of contracted pelvis.

(III) *Cholecystostomy:* One case, successful.

This case, a woman aged 25, had suffered from considerable pain and jaundice on frequent occasions. At the operation one stone (about the size of a small pea) was removed from the cystic duct; the gall-bladder was stitched to the parietal peritoneum.

(IV) *Operations for Removal of Fallopian Tubes and Ovaries, &c.:* Eighteen cases, all successful.

Case 1, aged 34.—Removal of right tube and ovary and left tube for double hydrosalpinx and cystic disease of the right ovary. Extensive adhesions.

Case 2, aged 33.—Removal of both ovaries for multilocular cysts in each. The vermiform appendix was also removed in this case, as it was involved in the adhesions and contained fæcal matter.

Case 3, aged 37.—Removal of both tubes and ovaries for large tubo-ovarian cyst on the left side and cystic degeneration of the right ovary

with the fimbriated extremity of the right Fallopian tube matted to its ovary by adhesions.

Case 4, an officer's maid-servant, aged 18.—This was a very interesting case of multiple cysts of the right ovary, which was about the size of of a walnut. This ovary was in fact a mass of small cysts, and there was also a number of small cysts along the right Fallopian tube and at its fimbriated extremity.

The history of this case was as follows: This girl had suffered from pain on and off for over three years before admission to hospital. This pain had no connexion whatever with her menstrual periods, which first occurred at the age of 17. She had previously had two very severe attacks of pain and vomiting, the pain being nearly always confined to the epigastrium. The first of these attacks occurred about three years before this admission to hospital, and she was then "very ill for nearly three weeks, during which time she was confined to her bed for a week with milk as her only food." The second severe attack was in November, 1910, when she "had to be kept in bed for three weeks, this attack being more severe than the previous one." The third attack commenced five or six days before, and continued till she was admitted to this hospital on April 14, 1911. I saw her through the whole of this attack. She vomited and retched persistently after the smallest quantity of fluid—e.g., milk, beef-tea, &c.; and any attempt to take solid or liquid food was soon followed by intense pain, which was at first localized to the pit of the stomach and later settled in the right iliac region, where she had some slight rigidity and tenderness. I considered that it was probably a case of appendicular colic and that, taking into account the history of the case and the amount of suffering the patient had already been through, an exploratory operation should at any rate be done to ascertain the cause of this condition. I therefore operated on April 15, the day after her admission to hospital. At the operation I found the condition of right ovary and tube as mentioned above, and removed both of these as well as the appendix.

It is now ten months since the operation was performed, and ever since then this girl has been quite robust, enjoying the best of health. She states that before she had the operation she never knew what it was to enjoy really good health. She has been quite free from pain ever since she left hospital. The operation was performed under stovaine.

Case 5, aged 27.—In this case there was double salpingitis; both tubes and ovaries were firmly bound down by adhesions in Douglas's pouch; the abdominal ostium of each tube was sealed; the large intestine and omentum were adherent to left Fallopian tube and ovary. The vermiform appendix was full of fæcal matter and contained a couple of threadworms. (This case of threadworms is not included in those mentioned above under Appendicitis.) Operation: Removal of right Fallopian tube and left tube and ovary, also removal of vermiform appendix.

Case 6, aged 33.—Removal of right tube and ovary and left tube and part of the left ovary, as well as a large piece of omentum. There was a cyst of the right ovary about the size of a large orange, and another cyst of the left ovary about the size of a hen's egg; both cysts contained clear fluid. This proved a troublesome case on account of the extensive peritoneal adhesions; the great omentum was bound down firmly in Douglas's pouch and to both ovaries, particularly on the right side.

Case 7, aged 29.—Removal of right Fallopian tube and ovary for cysts of right broad ligament and cirrhotic changes in the right ovary.

Case 8, aged 39.—Removal of both tubes and ovaries, for large cysts of both ovaries and right hæmatosalpinx; a good deal of free blood was found in the abdomen on opening it and also extensive adhesions.

Case 9, aged 21.—Removal of left tube and ovary, for cystic degeneration of left ovary.

Case 10, aged 27.—This woman was seven months pregnant and was suffering from a large cyst containing fifteen ounces of clear watery blood-stained fluid, connected with the right Fallopian tube and situated high up in the right flank, causing the patient great distress. I removed the right tube and ovary with the cyst after separation of the adhesions, and the patient made a rapid recovery. Pregnancy went on to full term and patient had a normal delivery, giving birth to a healthy child, and both mother and child did well.

Case 11, aged 23.—Removal of right tube and ovary for multiple cysts of the right ovary. The vermiform appendix, being kinked with a short mesentery, was removed at the same time. This operation was done under stovaine.

Case 12 (an officer's wife).—Removal of right ovary for multilocular cyst. The vermiform appendix contained a fæcal concretion and was removed as well. This patient had been under treatment for two years on and off in different places, for colitis and severe and persistent pain. Since the operation four months ago she has made a splendid recovery.

Case 13, aged 24.—In this case there was double pyosalpinx; the appendix was adherent to the right ovary, and contained a large fæcal concretion at its extremity: the ovaries were bound down by adhesions in Douglas's pouch. I removed the right Fallopian tube and ovary, also the left Fallopian tube and vermiform appendix.

The civil doctor who looked after her at her confinement in April, 1908, told me that this patient then had puerperal fever and was in bed two months; this was in all probability the cause of the double pyosalpinx.

Case 14, aged 34.—Removal of both tubes and ovaries for double tubo-ovarian cysts.

Case 15, aged 24.—This woman was three months pregnant. Her left ovary was completely converted into a thin-walled simple cyst about 2½ in. in diameter, and contained clear fluid, while half the right ovary was converted into a simple cyst about 1¼ in. in diameter. I removed

the cystic half of the right ovary, as well as the left tube and ovary. The patient made a rapid recovery, and pregnancy continued satisfactorily.

Case 16, aged 38.—Removal of left tube and ovary, after separation of adhesions, for cystic disease of the left ovary and salpingitis. The left tube and ovary and intestines were bound down by adhesions in Douglas's pouch.

Case 17, aged 26.—Was suffering from double salpingitis (both tubes being much distended mith mucus, and the mucous membrane much thickened); there were extensive adhesions, the intestines being firmly adherent to posterior surface of the uterus. The vermiform appendix contained a fæcal concretion in the middle. I removed the right Fallopian tube and ovary, and also the left Fallopian tube, after separation of adhesions. The appendix was also removed.

Case 18, aged 31.—Removal of right Fallopian tube and ovary, for cysts of right ovary. Adhesions.

(*V*) *Abdominal Hysterectomy.*—Five cases, all successful.

(1) Total hysterectomy, one case, aged 36, for carcinoma of the body of the uterus; in this case there was also a tubo-ovarian cyst on the right side.

(2) Supra-vaginal hysterectomy, four cases.

Case 1, aged 29.—This woman had a large dermoid cyst of the right ovary about the size of a man's head, and also cystic degeneration of the left ovary. There was a good deal of pelvic inflammation, the posterior wall of the uterus being involved in the inflammatory process. As both ovaries had to be removed it was considered advisable in this case to perform supra-vaginal hysterectomy as well. She afterwards went to India.

Case 2, aged 54.—Had chronic prolapse of uterus, giving rise to considerable pain, discomfort and disturbance of health. She had not menstruated for six years, but for a fortnight before this operation she had been losing blood from the uterus. When seen four months after the operation she was very well, and there had been no return of pain.

Case 3, aged 42.—Married, no children. Periods regular, no menorrhagia, and no metrorrhagia. This woman was suffering from multiple fibroids of the uterus. The total weight of all the firboid tumours, together with the normal-sized uterus, without the cervix, was 4 lb. One of the fibroid tumours was about the size of an infant's head, and grew from the fundus. Another large tumour grew from the anterior wall, and some smaller fibroids from the sides of the uterus. In addition, there was a large cyst in the left broad ligament containing 10 oz. of fluid.

Operation.—Left tube and ovary with cyst removed as well as supra-vaginal hysterectomy.

Case 4, aged 41.—Married thirteen months. This woman was four and a half months pregnant, and was suffering from large fibroid tumours

of the uterus, complicating pregnancy. There was a very large fibroid growing from the lower part of the posterior surface of the uterus and tightly impacted in the pelvis, causing pressure on the urethra. Another fibroid about the size of a hen's egg was situated on the right side of the uterus just above the level of the internal os; a third, about the same size, was situated in the left upper segment of the uterus, and there were some smaller ones in other parts of the uterine wall. The fœtus was about 6 in. long.

This patient had been suffering for some time before admission to hospital from increasing irritability of the bladder and increased frequency of micturition. Considering the early stage of pregnancy it would have been absolutely dangerous to this woman to have allowed the pregnancy to continue until the child was viable before doing the operation, especially as fibroids grow so rapidly during pregnancy; as it was, the large fibroid in the pelvis could only be displaced with the utmost difficulty.

This operation (supra-vaginal hysterectomy) was performed by Captain Easton, R.A.M.C., and the patient made a rapid recovery.

(VI) *Operations for Intussusception.* — Two cases: 1 successful, 1 died.

Case 1.—A child, aged 7 months. The intussusceptum consisted of cæcum, vermiform appendix, and small intestine. This child made an uninterrupted recovery.

Case 2 was a child aged 5 months. Although it is shown above as having died, yet, as regards the operation, this case was also absolutely successful, for it died of acute pneumonia twenty-six hours after the operation when the wound looked very healthy and dry, and the whole of the abdomen was quite lax, showing no sign of peritonitis or other abdominal trouble.

This child was brought in from Bordon Camp in a motor (a distance of fourteen miles) at 2 a.m. by Lieutenant Laing, R.A.M.C.; it had suffered from a "severe cold" for ten days before admission, and for the last two of these days it had considerable bronchitis. The chloroform and ether used at the operation no doubt rendered the condition of the chest much worse.

The operation was performed seven hours after onset of first symptoms; there had been a good deal of hæmorrhage from the bowel, and about 18 in. of bowel were invaginated into the colon, the end of the intussusceptum reaching as far as the sigmoid flexure of the rectum; it was successfully reduced, though with some difficulty.

(VII) *Operations for Ectopic Gestation.*—Four cases: 4 successful.

Case 1, aged 34.—The patient had had four children, the youngest being 5 years old. After the birth of the last child the periods had always been regular until a miscarriage, which occurred in January, 1910 —i.e., a year before admission. After that miscarriage the periods were

again regular till December 27, 1910, when she went three days over the proper time; she then had an attack of hæmorrhage which lasted until January 12, 1911 (the day of admission to hospital). On the night before admission she was seized with a severe and sudden attack of pain in the right side of abdomen. On opening the abdomen it was found that the left Fallopian tube formed the sac, and there was an opening $\frac{3}{4}$ in. in diameter in the posterior surface of the tube (the site of rupture). I removed the left tube and ovary.

(I have frequently observed, in the case of disease of the pelvis, that the lesion is on one side of the pelvis, while the pain is referred to the opposite side.)

Case 2, aged 25.—Married two years, had one child which was born in October, 1910, and died almost immediately. After the birth of that child her periods were regular every month until January 28, 1911, when she was eight or ten days overdue (her last regular period having occurred from December 20 to 24, 1910, a normal period). On January 28 bleeding commenced and continued all the time (*without clots*) until admission to Hospital on the evening of February 21, 1911 (that is to say, over three weeks). On admission she had considerable pain and tenderness in the right iliac region, and pointed to McBurney's point as the most painful spot. I decided to operate at 9 o'clock on the following morning. During the night, however, she passed a typical complete triangular decidual cast of the uterus, thus confirming the diagnosis of ectopic gestation.

Laparotomy was performed, and a good deal of free blood and clots were found in the abdomen; the left Fallopian tube formed the gestation sac, and was ruptured. I removed the Fallopian tube with the gestation sac.

Case 3, aged 29.—The patient had three children, youngest aged 9 months; it was only suckled for one month. This patient came to see me at the inspection room on October 12, 1911, and I immediately sent her to the Louise Margaret Hospital, and operated on her three hours afterwards.

The history of the case is as follows: She had suffered a good deal of pain in the right iliac region for a fortnight before admission, and also complained of "shooting pains" down the right leg. Her periods returned one month after the birth of her child; she had never been quite regular as regards these; it was not at all uncommon for her to go five weeks between the periods, but this time the period was seven or eight days later than usual.

On vaginal examination it was found that the uterus was somewhat enlarged, but there was no softening of the cervix; blood was oozing from the cervical canal; a hard and tender mass was felt in the right and posterior fornix; externally there was pain and tenderness over the right iliac region, but no muscular rigidity.

On opening the abdomen there was a small amount of free blood in the abdominal cavity. The sac was formed by the right Fallopian tube. This and the right ovary were bound down by adhesions in Douglas's pouch.

I removed the right Fallopian tube and sac. On the posterior wall of the Fallopian tube was a small round area (about the size of a threepenny-piece) where the wall was much thinned, as if the sac had been on the point of rupturing at that spot, but the ovum had aborted through the abdominal ostium.

Case 4, aged 26.—Youngest child, aged 5. No miscarriage since. This woman had had several attacks of pain on the right side of abdomen, with vomiting, for three or four weeks before admission to hospital, but had had no rise of temperature or increased pulse-rate; she had missed two periods; and on the evening after admission she had some slight vaginal hæmorrhage.

On opening the abdomen a large amount of free blood escaped from that cavity; there was a good deal of peritonitis of several days' standing, the adhesions being very firm; the great omentum was bound down in Douglas's pouch by adhesions, and the vermiform appendix was also firmly involved in the adhesions. The ovum with placenta was on the right side of the pelvis, the rupture having occurred in the right tube, and was covered over by adhesions. In addition to the ectopic gestation on the right side, there was also a left hæmatosalpinx. I removed both tubes and ovaries, and also a portion of the omentum and the vermiform appendix.

The fœtus was 2 in. long; its abdomen had not quite closed; the placenta was about 3 in. in diameter, and its separation caused a certain amount of troublesome bleeding at the operation. The patient made an excellent recovery; the stitches were removed on the eighth day.

(VIII.) *Removal of Right Kidney.*—One case, successful.

This operation was performed for a very large hydronephrosis, in which the kidney substance was reduced to a mere capsule forming the cyst wall. The patient made a good recovery, but in this case there was a stitch abscess which took a few days to heal.

(IX.) *Operations for Radical Cure of Ventral Hernia.*—Two cases, both successful.

(X.) *Operations for Radical Cure of Umbilical Hernia.*—Two cases, both successful.

(XI.) *Operations for Radical Cure of Inguinal Hernia.*—Twenty-seven cases, all successful.

In two of these cases an ovary formed one of the contents of the hernial sac, and in three the vermiform appendix did so. One of the cases was a strangulated hernia.

(*B*) Miscellaneous Operations.

These include the following, and do not call for further notes:—

One amputation through knee-joint; 1 operation for cleft palate;

4 for removal of cysts by dissection (including 1 large semi-membranosus cyst, 1 sebaceous cyst, 1 Meibomian cyst, 1 ganglion of the hand); 8 excisions of nævi; 3 for removal of nævi by cauterization; 2 for excision of varicose veins of leg; 2 ligature and excisions of internal piles; 3 operations for fistula; 118 circumcisions; 1 operation for osteomyelitis; 5 operations for removal of foreign bodies from the tissues; 1 thoracoplasty; 1 amputation of finger; 1 amputation of toe; 2 amputations of supernumerary fingers and toes; 2 operations for excision of supernumerary appendages to the ears; 2 erasions of joints for tubercular disease; 11 erasions of glands; 2 operations for dissection of tubercular glands from the neck; 1 pyæmic abscess opened; 3 large abscesses of connective tissue opened and drained; 1 large popliteal abscess opened and drained; 1 operation for suppurating bursa patella; 1 large prepatella bursa removed by dissection; 5 abscesses of breast opened and drained; 1 whitlow finger incised; 1 mastoid abscess opened and drained; 1 modified Stäcke's operation for mastoid disease; 2 cases of tenotomy; 1 operation for mal-united fracture; 1 operation for fibrous ankylosis of elbow-joint; 1 avulsion of nail of big toe; 23 operations for removal of adenoids alone; 74 operations for removal of adenoids and tonsils at the same time; 26 operations for removal of tonsils alone; 1 excision of lipoma of back; 1 excision of fibro-cartilaginous tumour of back; 1 hydrocele tapped; 2 for removal of rectal polypi; 1 removal of polypus of uterus; 8 dilatations of cervix uteri and internal os for spasmodic dysmenorrhœa; 28 curetting of uterus (for subinvolution, endometritis, and retained placental products); 1 perineorrhaphy; 7 inductions of premature labour (1 for contracted pelvis and 6 placenta prævia); 2 excisions of portions of cervix uteri for examination.

In nearly all the cases a general anæsthetic was used; but lately stovaine, injected into the lower part of the spinal canal, has been employed in a few cases, and with great success, viz., in 1 case of appendicitis, 1 ovariotomy, 4 children for radical cure of hernia, including 1 case of strangulated hernia (aged respectively $6\frac{1}{2}$, $1\frac{1}{4}$, $2\frac{1}{8}$, and 2 years), 1 amputation through the knee-joint (a child aged $1\frac{1}{2}$); total, 7 cases. These were followed by no ill-effects, except in the case of ovariotomy, in which the patient had vomiting and headache for two days only.

My thanks are due to Captains Ryan and Easton for their valuable assistance during the year. Some of the operations were performed by these two officers.

Reviews.

MODERN MICROSCOPY. A Handbook for Beginners and Students. By M. I. Cross and Martin J. Cole. Fourth Edition. Ballière, Tyndall and Cox., 1912. Demy 8vo, pp. xviii. 327. Illustrations 113. 6s. net.

This book is intended for beginners in the science and for those who are more or less amateurs, and in so far as it deals with the actual understanding and the working of a microscope it is very good. The first essential for any one who aspires to the science of microscopy is the knowledge of his instrument, and this book will be found useful to those desirous of investing in a microscope and anxious to obtain the best results.

In the selection of a microscope, however, the authors do not in our opinion give due prominence to the excellence of the continental microscopes for bacteriological work.

Part II deals with the methods employed in preparing pathological and bacteriological material for examination, also with the methods of examination of vegetable tissues, metals, insects, crystals and foramenifera.

Always bearing in mind that the book is intended for amateurs, these chapters strike one as being too ambitious, especially those dealing with pathology and bacteriology. Too much is attempted and the simple details of technique so essential to successful microscopic work are lacking. The methods described are crude, in many instances are antiquated and out of date, and some are inaccurate.

Part III consists of a collection of papers by various authors on subjects of interest to the working microscopist, such as the use of the petrological microscope, and the collection, examination and preservation of rotifera, fresh water mites, foramenifera, mosses and liverworts. The last chapter contains a short account of the microscopy of foods with special reference to adulterations.

J. C. K.

THE PRINCIPLES OF SANITARY TACTICS. A Handbook on the Use of Medical Department Detachments and Organizations in Campaign. By Edward Lyman Munson, A.M., M.D., Major, Medical Corps, U.S. Army, approved by the Surgeon-General U.S. Army and published with the consent of the War Department. 1911. Pp. 306. Price 2 dollars. Agents: U.S. Cavalry Association, Fort Leavenworth, Kansas, U.S.A.

This book forms one of a trio; it is intended to be read in conjunction with "Medical Service in Campaign," by Major Straub, and "A Study in Troop Leading and Management of the Sanitary Service in War," by Lieutenant-Colonel John F. Morrison, General Staff and Major Edward L. Munson, Medical Corps U.S. Army, both of which have already been noticed in the Journal.

Major Straub's book deals with the general principles underlying the work of the Sanitary Service in war, the book by Morrison and Munson illustrates the working out in detail of a large comprehensive problem, whilst the present book treats of minor problems belonging to the lesser

units, and should, therefore, be taken as an introduction to the second named. The three books emanate from the Army Service Schools at Fort Leavenworth, Kansas, and cover the course of instruction in the work of the sanitary service given in that institution. They are the result of close co-operation between the General Staff and the Medical Service, and being published with the authority of the War Department, may be taken as an authoritative exposition of the work of the Medical Service in war, as understood and taught in the U.S. Army. They reflect the latest lessons of recent experience of war and together form the best compendium of the subject yet written in English. By their publication the Leavenworth School has not only benefited the medical service of the U.S. Army but has done good work for English speaking military surgeons wherever found.

The first chapter of the book under review deals briefly but graphically with the evolution of the medical service with armies in the field. Treating the American Civil War with more detail it sketches the progress of the service from chaos to order and efficiency during the course of that long struggle, the passive obstruction which had to be overcome, and the contrast between the state of affairs before and after a properly organized medical service had been instituted.

Thus, after the second battle of Bull's Run, on August 30, 1862, when the war had already been in progress for sixteen months, Surgeon-General Hammond wrote, on September 7, 1862, to the Secretary of War, pointing out that owing to the lack of any specially organized system for the removal of the wounded in the army of Virginia 600 still lay on the battlefield eight days after the battle. "Many have died of starvation, many more will die in consequence of exhaustion and all have endured such torments which might have been avoided." Looked at from the purely military standpoint what a cruel waste of trained fighting material does not this reveal.

Surgeon-General Hammond had already put forward a plan to obviate the recurrence of such a disastrous state of affairs, but nothing was done. The condition, however, was too intolerable to last indefinitely, and what representations were powerless to effect for the whole army was done piecemeal by individual Generals. Thanks to the organizing genius and pertinacity of Letterman, whose name military medical officers will always link with those of Larrey and MacGrigor, in August, 1862, General McClellan led the way and issued an order for his own army embodying a plan formulated by that medical officer for a definitely organized ambulance corps.

So good were the results that Grant adopted the same procedure in the Army of the Tennessee in an order dated March 30, 1863. A year later in March, 1864, Congress at length passed an Act extending the system throughout the military forces of the Union. Under the new *régime* greatly improved results were obtained at Antietam and Fredericksburg, whilst at the battle of Chancellorsville, in May, 1863, after the charge on Marye's heights, when over 800 fell in less than half an hour, all were retrieved and in the hospitals two hours after the engagement. Similarly at Gettysburg with over 14,000 fallen, not one was left on the ground in the early morning of July 4, the day after the battle had ended. The enormous resultant gain to the efficiency and mobility of the army was quickly recognized.

But to attain results such as these some knowledge of how to adapt methods to the requirements of tactical and strategical considerations is required on the part of medical officers. In the Civil War the lesson was learned in the hard and costly school of experience, it was forgotten and had to be re-learned in Cuba. By publications like the present, the American service is taking steps to garner the fruit of experience for future use.

The second chapter deals with the tactical instruction of medical officers, its scope and limitations. Whilst asserting that medical officers need no profound knowledge of military tactics as such, it enforces the lesson that they must possess a sufficient general knowledge to give them an insight into intentions, to appreciate the course of events and to adapt their own measures thereto.

"Whilst the sanitary service is a subordinate, it is also a co-ordinate branch of the military service as a whole; and after it has received general orders relating to the purpose in view it should be capable of administering itself and its units in a tactical sense, within itself, and in relation to the other components of a military force, in thorough consonance with such general purpose."

To enable it to fulfil this mission previous study is essential, it cannot wait on events and trust to inspiration, the lessons of bygone experience must be learned and applied if bygone errors are not to be repeated.

The necessary caution is subsequently given that sanitary tactics can never be an end in themselves. Armies only fight to gain a definite end, the cost cannot always be counted and sanitary dispositions must ever be limited by the fact that they cannot be allowed to hinder, and can only be tolerated in so far as they help in the attainment of the end in view. That they can often materially help experience abundantly proves.

The remaining parts of the book are taken up with a graduated series of problems dealing with the work of the medical service with (1) the detached battalion and squadron; (2) the regiment of three battalions; (3) the brigade *plus* a proportion of cavalry and artillery; and (4) the infantry division.

The problems are thirty-five in number and are of great variety. They include instances of attack, defence and retirement, advanced guards and rear guards, dispositions after success as well as those more difficult ones after a reverse.

The ground is that of the vicinity of the School at Fort Leavenworth and is illustrated by a series of clearly drawn maps on which the various steps can be followed without great difficulty. The solutions of the medical problems are reasoned out and though it is not pretended that alternatives might not be followed, the steps adopted have always solid ground for their selection. The book is not one to be lightly skimmed, each problem requires study on the map with scale and compass, but any medical officer who gives the attention needed and works out for himself, step by step, the series of exercises will not fail to derive solid profit.

M. W. R.

Prevention of Disease and Inefficiency, with Special Reference to Indian Frontier Warfare. By Lieutenant-Colonel Patrick Hehir, I.M.S. Pioneer Press. Allahabad. 1911. Second Edition. Illustrated and revised. Pp. 655.

In the preface to his "Military Hygiene," published in 1901, Munson tells us that save for a small collection of sanitary precepts, intended for

the use of officers of the line, no book exclusively devoted to the preservation of the health of troops has been published in the English language for more than a generation. That the present generation is rapidly making good the deficiencies of the last may be accepted, we hope, as evidence of increasing interest taken in these matters.

It is natural that each succeeding author should make full use of the work of his forerunners, but we think there is a tendency to accept with too blind a faith statements and propositions that progress of knowledge and experience have shown to require modification. We wonder, for instance, how often the improvised tub and box filters, the figures of which are so familiar, have been used with success on service since Parkes first described and figured them in 1864; and which are the foreign armies still clothing their men with foot-cloths instead of socks. It would seem, too, that the oft-quoted classification of waters as wholesome, suspicious, and dangerous, based only on the nature of their sources, and drawn up by the Rivers Pollution Commissioners for Great Britain in 1868—that is, before the birth of bacteriology—is an unsafe guide for all parts of the world to-day. Many other examples could be cited.

Colonel Hehir's book covers a wide range, wider than its somewhat modest title would suggest. Much space is given to cantonment sanitation, and twenty pages to the anatomy and physiology of the respiratory, circulatory, and digestive systems; while the treatment of some diseases is included and even the ventilation of the dwellings of "purdah-nashin" ladies is touched on.

The arrangement of the book suggests that much of the matter has been compiled in the form of lectures, delivered, perhaps, to audiences of different classes. This may account for the rather frequent repetitions and the variations from technical language in one part to a more popular style in others.

The book contains a great amount of most useful information, but one is startled from time to time in reading it by the association of somewhat ancient faiths with modern theories. We are told on the one hand that bad smells turn milk sour and cause many forms of infectious fevers, and on the other that boiled and filtered water, preserved and distributed in sterilized containers, is one of our greatest auxiliaries in the prevention of disease in India; and that soldiers should use sterilized water for brushing their teeth and sprinkling on the floors of barrack rooms.

A number of matters which are put forward as recommendations have been introduced for some years in the army in India: Dining halls for British troops, impermeable floors for latrines, and regimental chiropodists; while cholera belts are no longer a part of the soldier's "necessaries," as the author seems to think; "combined training," which is repeatedly quoted, has been obsolete since 1909; command sanitary officers no longer exist and the "experimental" infantry equipment is no longer experimental.

We are sorry to see a statement perpetuated from another work to the effect that about 8 per cent. of soldiers wet their bedding at least once a month. A statement so discreditable to the Army, and, as we believe, so wanting in accuracy, is to be regretted.

As a compendium of information concerning the prevention of disease among troops in India, such as does not exist in one volume elsewhere,

the book should prove of value to those responsible for cantonment sanitation, and perhaps particularly to the Subordinate Medical Services, for whom works of reference are not freely available.

Considering that the work is a second edition the number of words misspelt, and figures misquoted, is surprising; while the pleasure of reading it is not enhanced by split infinitives and other lapses of syntax which have escaped the eye of the proof-reader. In more than one case where quotation marks are used the original text has been considerably altered.

A. R. A.

British Red Cross Society. Training Manual, No. 3. By Colonel James Cantlie, V.D., M.B., &c., R.A.M.C. (T.F.) Cassell and Company, Ltd. 1911. Pp. 226. Full-page plates, 8. Illustrations, 136. Price 1s. net.

This Manual is issued with the approval of the War Office and is one of three compiled by the same author, the others being on "First Aid," and "Nursing," as the Official Manuals of the British Red Cross Society. No. 3 contains, as a preliminary, a short account of the objects and organization of the British Red Cross Society, with special reference to the Voluntary Aid Detachments which are being organized and trained under its guidance by the County Associations, the system being based on the "Scheme for the Organization of Voluntary Aid in England and Wales," issued by the War Office in December, 1910. It will form the text-book for the training of these detachments—the personnel of which by the end of October, 1911, amounted to 27,861. In his preface Colonel Cantlie points out that the Manual is intended to guide those who have already acquired a knowledge of First Aid and Nursing, to act collectively in carrying out Red Cross work, to accustom them to discipline and to stimulate their initiative in improvising help, shelter, and transport for the sick and wounded. The early chapters are devoted to recruit drill, stretcher exercises and ambulance wagon drill—the methods adopted conforming closely to those of the Regular Army.

There is a good chapter on improvised stretchers, with special reference to a rope stretcher recommended for Voluntary Aid Detachments. The fitting up of carts and wagons is fully dealt with and improvised "carrying chairs" are well described.

The chapter on Sanitation is the one disappointing feature of the Manual. Clarification of water is thoroughly described but the modern candle filter is little more than mentioned. The main object of filtration is lightly touched upon and a modern filter is not described.

The disposal of refuse is dealt with superficially—a faulty grease-trap is described, and camp incinerators are not mentioned. The deep trench latrine is practically the only provision suggested for the disposal of both fluid and solid excreta. Camp kitchens are elaborately dealt with.

In the chapter on tents it is stated that a hospital of tents is preferable in every way to the system of apportioning cases to public buildings. This may be so in special circumstances, but so far as the Voluntary Aid Detachments are concerned the utilization of public buildings, such as schools, is surely to be commended. Atmospheric conditions would often be a determining factor. Improvisation of shelter, beds, bedding material, &c., is decidedly well treated.

The remaining chapter deals exhaustively with various subjects such as surgical cleanliness, disinfection, treatment of wounds, hygiene on the march, food and cooking, ambulance organization in the field, transport by rail, selection of buildings for the accommodation of wounded, &c., &c, Colonel Cantlie is to be complimented upon having elaborated such a clear and comprehensive Manual on Field Medical Work. It deserves close and careful study by all interested in the subject and will form a handbook specially useful for the personnel of Voluntary Aid Detachments.

C. K. M.

SECTION AND COMPANY DRILL MADE EASY. By an Adjutant. Messrs. Gale and Polden, Ltd., Aldershot. Pp. vii. and 115. Price 1s. 6d.

Section and Company drill are so clearly described in the 1911 edition of Infantry training that the need for such a work as this does not appear to be very great. To those, however, who find any difficulty in understanding section or company drill, this book should prove useful, as it contains many excellent illustrations which help to elucidate the text, and which show clearly and at once how each particular movement, from original to final formation, is carried out.

The book is up-to-date and, except for one or two trifling and obvious errors, is accurate.

F. S. I.

THE TERRITORIAL DIARY AND NOTEBOOK FOR 1912. By T. Gibson, R.A.M.C. (T.F.) London: (Forster, Groom and Co.). Pp. 286.Price 6d. Binding 1s.

It is good that in his daily life a man should be reminded of his Territorial duties and he will do well to carry this little book in his waistcoat pocket. It will serve as his ordinary diary and, at the same time, as a reminder of his regimental duties.

The letterpress is compiled evidently by one who knows just those small points in field work, signalling, and so forth which are apt to slip the Territorial memory, between camp and camp. The hygiene and first-aid notes are sound.

STEPPING-STONES TO HEALTH ON THE NILE. By F. W. Saunders, M.B., B.C. Crown 8vo. Pp. 16. Price 1s. Lewis and Co., London. 1911.

This is a small pamphlet giving the characteristics of the various health resorts in Egypt with general advice as to seasons, clothing, and modes of life. It will, undoubtedly, prove useful to medical practitioners and to invalids going to Egypt for the benefit of their health.

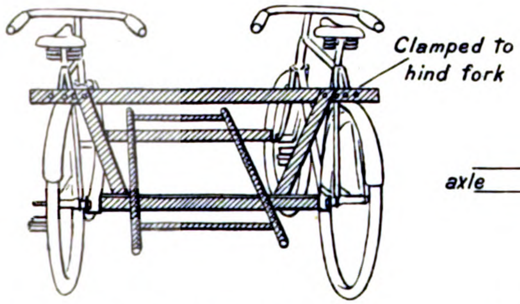
C. H. S.

Current Literature.

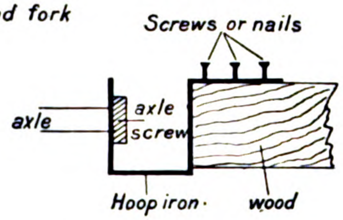
Extemporized Method of Coupling Bicycles to form a Four-Wheeled Support for the Carriage of Wounded.—By Stabsarzt Dr. Sachs Müke (*Deut. Militärärzt. Zeit.*, February 20, 1912). This device can be constructed with the ordinary tools which the troops carry, some hoop iron, pieces of wood (such as railings are made of), screws, and nails. Cost of material, 1 mark.

It is not necessary to heat the iron, but careful working is required.

The axles of the hind wheels are coupled together by a strong bar of wood, whose ends are furnished with pieces of hoop iron bent into the shape shown in the smaller figure (see diagram). One limb of the bent



Apparatus fitted, added parts shaded; skeleton stretcher to show how supported.



Detail of attachment of coupling bars to axle (diagrammatic).

hoop iron is perforated to admit the axle screw, by means of which it is fastened to the fork of the bicycle, the other limb is fastened to the upper surface of the wooden bar by ordinary screws or nails. The front wheel axles are similarly connected.

The wooden bars appear to be of about 3 in. by 1 in. in cross section, and about 4 ft. long. The hinder piece is further supported by means of a longer piece of wood, which is fixed by hoop iron, clamps, and screws to the back of the hind forks above the mudguard; diagonals are fastened to both the upper and the lower pieces with nails or screws, and give rigidity in the transverse and vertical sense. The front coupling bar must be rather larger (in section) than the rear one.

It will be seen that this method is a hasty improvisation, and that no means of keeping the front wheels parallel in steering is provided. Therefore skilled riders are a necessity.

H. E. R. J.

Coupled Bicycles for the Carriage of Stretchers.—Dr. Jules Nord, Lieutenant-Colonel of the Netherlands Army Medical Service, has described (*Le Caducée*, February 17, 1912) the following method of coupling bicycles, by which means two bicycles can be transformed into a four-wheeled vehicle for the carriage of a stretcher.

The problem of transforming bicycles into vehicles suited to the conveyance of sick has not yet been solved. By means of the coupling constructed by the author, and manufactured in the Fongers' workshop at Gröningen (Holland), two bicycles of any kind can be converted into a comfortable stretcher carriage with four wheels.

This coupling has been tried on very bad roads, and during the manœuvres of the Medical Service and of the Netherlands Red Cross Society, and has proved eminently satisfactory.

The Boy Scouts have adopted the coupling for their drills.

The coupling may be of service in armies not only for carrying sick and wounded, but also for transporting inanimate burdens, such as victuals, medicaments, dressings, &c. Any kind of stretcher, a plank, a ladder, a door, &c., can be suspended from the hooks.

The coupling consists of:—

(*a*) Four *brackets*, two for each bicycle.
(*b*) Two coupling *tubular bars* with fastenings.
(*c*) Four *stretcher hooks*, two to each bar.
(*d*) Two steering-rod *carriers*, one for each steering head.
(*e*) Two *steering-rods*, one to each head.
(*f*) Two *spring clips*, one for each front fork (to hold the steering-rods when bicycles not coupled).
(*g*) Two screw *spanners*, one for each bicycle.

The *brackets* (consoles) are fittings with a tubular portion into which the coupling bars are inserted and fixed by *nuts* (tenons).

One bracket is fixed low down to the front vertical tube of the bicycle frame, and the other to the rear one at the same level. The coupling bars are inserted into the tubular part of the brackets and fixed by nuts.

The *stretcher hooks:* To each coupling bar are suspended two stretcher hooks with rings, on which there is a clamping screw. These hooks can be moved along the coupling bars, from which the stretcher is suspended. The steering-rod carrier is fastened to the vertical tube of the steering-head, and serves to carry a lamp. The steering-rods are coupled by a screw sleeve, and articulate with the steering-bar carriers in such a way as to be removed easily when the bicycles are not coupled. At the end of each bar (near the carriers) is an adjusting screw to regulate the length of the joined steering-bars.

The *spanners:* Each bicycle carries its own spanner to screw or unscrew the various parts.

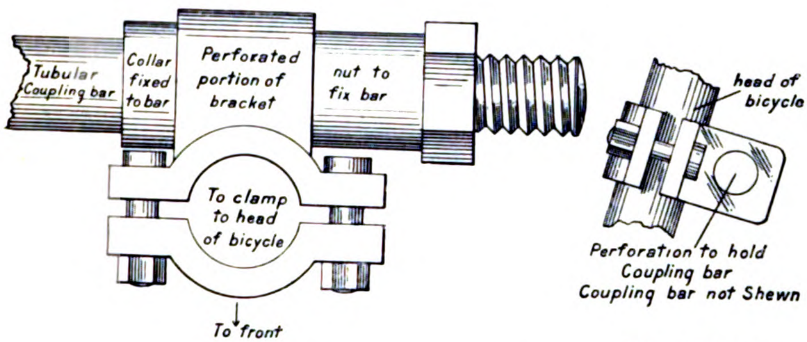
Method of Attaching the Stretcher.—The coupled bicycles are wheeled over the stretcher which is laid upon the ground. The two hooks on one side are drawn aside. One side of the stretcher is placed upon the two hooks which have not been moved; the other hooks are then replaced, and the stretcher rests upon the four hooks by its own weight.

Each bicycle carries half the coupling apparatus; the two halves are absolutely alike. The stretcher (special) is made of six pieces and two canvases. Each bicycle carries half a stretcher.

This invention appears to be mechanically sound. Its features are:—

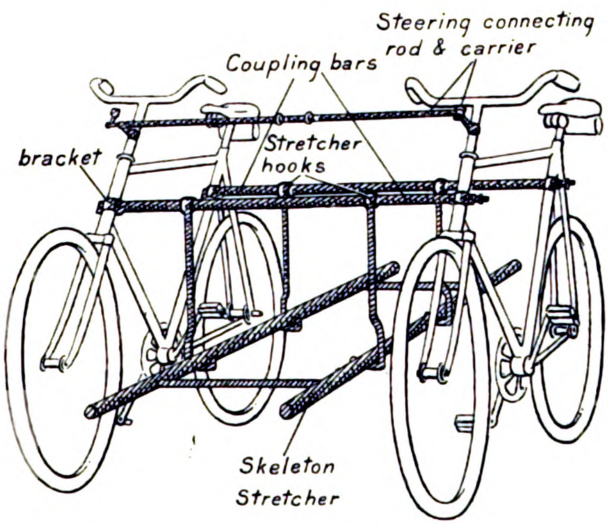
That by the fixture of two tubular bars to the heads and saddle supports of two bicycles by means of brackets (whose apparent detail is shown in the third figure) a rigid quadrilateral frame is formed, from

which the stretcher is suspended by means of rods and hooks; the rods are provided with rings at their upper ends to enable them to slide upon the carrying bars; screws are provided to clip them at any point.



Side elevation.

Probable detail of bracket and coupling bar in plan.



Sketch to show two bicycles coupled up and method of suspending stretcher (diagrammatic); added parts shaded.

Note to the Illustrations.—The illustrations to the article in *Le Caducée* are from photographs, and the scale is not large enough to make the details of construction evident. Therefore, these details are to some extent conjectural. But the general plan of construction is sufficiently clear.

The bicycles are kept parallel and the steering is effected by a connecting rod, with a fine adjustment for length, which articulates with a short arm clamped to the front of the handle bar tube, so that the front wheels are always kept parallel and turn together.

The coupling bars seem to be about 4 ft. in length, and sufficient space is left between the pedals and the stretcher for the front wheels to be able to turn through a considerable arc without touching the stretcher.

The hooks are about 2 ft. apart from front to rear, and thus the middle third only of the stretcher receives firm support. The centre of gravity of the patient, however, falls into this section. The stretcher hooks seem to be about 14 in. from the ground.

It would require two bicyclists working evenly to carry a patient properly, and it is conceivable that a rough or uneven road would throw a considerable strain upon the coupling, but the apparatus should be useful for cyclist troops upon reasonably good roads.

A special stretcher is described for use with the apparatus, but the details of its construction cannot be ascertained. Further than that it consists of six pieces, three of which are carried on each bicycle, and a cloth which is in two halves, one-half carried on each bicycle. The stretcher probably has each pole (of tubular steel) either jointed and capable of being doubled up with a sleeve to make it rigid when straightened out, or else in two separate pieces which can be rigidly united; there are also two traverses, one to be carried with each half pole. H. E. R. J.

Neo-Salvarsan.—Ehrlich had experimented with 605 organic compounds before he attained success with "606," or salvarsan, which he introduced more than two years ago. Though syphilis has been cured by a single dose of this remedy, yet this does not occur in every case, and the hopes which were first entertained have not been completely fulfilled. He has been occupied in the interval with researches whereby its action might be rendered more efficient; and now comes the report by Schreiber (*Münch. med. Wochenschrift*, April 23, 1912) on the substance, the serial number of which is 914, called neo-salvarsan. Neo-salvarsan is a condensation product formed by the action of formaldehyde sulphoxylate of sodium—$CH_2(OH)\text{-}O\text{-}SO\text{-}Na$—on salvarsan.

This reagent possesses the property of uniting with amido groups, thus—

$$R.NH_2 + (HO)CH_2\text{-}O\text{-}SO\text{-}Na = R.NH.CH_2\text{-}O\text{-}SO\text{-}Na + H_2O$$

Now salvarsan, which is di-oxy-diamido-arseno-benzol, has two amido groups. Neo-salvarsan is the mono-product.

Ehrlich had observed some years previously that the substances resulting from the action of formaldehyde-sulphoxylates were readily soluble. This suggested to him a way by which one of the drawbacks of salvarsan could be removed.

Neo-salvarsan is a yellowish powder which is very soluble in water and forms a neutral solution.

Kersten has made animal experiments, and finds that 1·5 grm. neo-salvarsan is equivalent to 1 grm. of salvarsan. Rabbits can tolerate 0·2 grm. of neo-salvarsan, and only 0·08 grm. of salvarsan. The therapeutic action of neo-salvarsan on the spirillum and on nagana infections of animals was more marked than that of salvarsan.

Since October last, Schreiber has administered neo-salvarsan to 230 patients in 1,200 injections, mostly intravenous. It is dissolved imme-

diately before use in warm, germ-free, distilled water. Very slight agitation is required to effect this. Violent shaking must be avoided, since poisonous oxidation products are formed thereby. Sodium chloride causes decomposition, hence physiological saline fluid cannot be used as a solvent; 0·6—1·5 grm. are dissolved in 200—250 c.c. of water. The solution is hypotonic, but no evil effects have been noted on this account; 0·8 grm. in 22 c.c. is the isotonic point. He begins with 0·9 grm. for a man, 0·75 grm. for a woman, 0·15 grm. for a child, and 0·05 grm. for an infant. On the first day he gives a man 0·9 grm., on the third 1·2 grm., on the fifth 1·35 grm., and on the seventh 1·5 grm. If the patient be very robust he administers to him 1·5 grm. on each occasion, so that he has received at the end of seven days 6 grm. of neo-salvarsan, equivalent to 4 grm. of salvarsan. Smaller quantities must be injected in cases in which headache or cerebral symptoms are pronounced, for it is in such that most of the untoward effects of "606" which have been reported have been noted.

Neo-salvarsan is as quick as, or quicker, in its action than salvarsan. The treponema disappears within twenty-four hours, sometimes within four hours. The intravenous injections cause very slight constitutional disturbance. Albuminuria has not occurred even after a maximum dose. Urobilin may be present in the urine for a few days. Herxheimer's reactions are frequent. Arsenical rashes sometimes appear eight to twelve days after treatment. Leucocytosis may be found.

The Wassermann reaction became negative in sixty-one out of ninety-seven cases. In one-third of these the change from positive to negative took place in a fortnight. Five of these patients have been kept under observation from three to seven months. Three were in the primary stage when treated.

Schreiber advocates excision of the initial lesion, and a course of four intravenous injections of neo-salvarsan. The blood should be tested fourteen days after the last injection and re-examined every four weeks. If the reaction should become positive, then two more doses of neo-salvarsan are given, followed by energetic mercurial treatment, and in late cases by the administration of iodides. He has had no nerve or cerebral complications among his patients.

Intramuscular injections of neo-salvarsan are accompanied with fewer local changes than are those of salvarsan. There is no induration and no necrosis. They may give rise to pain, hence he recommends that 5 c.c. of a 0·5 per cent solution of novocain should be injected as a preliminary measure; 1·5 grm. of neo-salvarsan dissolved in 20 c.c. of water are then introduced through the same needle.

C. B.

Nerve Sequelæ in Syphilis.—Benario (*Wiener med. Woch.*, February 24, 1912, p. 585) has collected the reports of various observers on the frequency of nerve complications in cases of syphilis treated with salvarsan. He finds that there have been ninety-two "neurorecidive" in 8,664 patients, or in just over 1 per cent.

C. B.

Salvarsan in Cerebro-spinal Syphilis.—Klieneberger (*Berlin. klin. Woch.*, March 4, 1912, p. 443) has treated with salvarsan eighty-seven

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patients who have been suffering from syphilitic nerve disease. For the most part he has used intravenous injections of 0·3 to 0·4 grm. of the remedy. The hopes that were first entertained of the treatment of general paralysis of the insane by salvarsan have not been fulfilled. Cure is unknown. Of thirty-one general paralytics seven died within a few weeks or months, sixteen quickly went downhill, declining in both bodily and mental health; two suffered from paralytic seizures a day or two after the injection; five remained unchanged; three improved, though there was an element of doubt in the diagnosis, or they had passed through an acute illness. This has often been observed to have a favourable effect on the progress of general paresis. He thinks that salvarsan does more harm than good in this disease. In locomotor ataxy the results are less unfavourable. It should be remembered that tabetics are often benefited by suggestion. Several observers report improvement in the lightning pains, gastric crises, and sometimes in the sensory and ataxic symptoms under "606" therapy. Perforating ulcers have healed, knee-jerks have returned, pupil reactions have become normal, vision has been restored, optic neuritis has lessened, according to some clinicians. The immediate effect of the salvarsan may be to cause an aggravation of lightning pains or crises. This is generally of temporary duration, but lasting deterioration has been recorded. Almost all of Klieneberger's eleven ataxic patients experienced a passing amelioration, but they relapsed in a week or so and were not relieved by a repetition of the dose. He thinks that the temporary improvement was no greater than might have occurred under other remedies. In syphilitic disease of the arteries, meningitis, or gumma of the brain, salvarsan may cause rapid improvement. Its action is better in early than in late cases. Headache disappears, sometimes within twenty-four hours, even if it has persisted for months. Vomiting and vertigo cease. Choked disc or optic neuritis may undergo retrogression, pupil reactions may return, and vision may improve. Paralyses of the cranial nerves are benefited. Hemiplegia, bladder and rectum troubles are favourably influenced. Epilepsy of specific origin has been cured. Nevertheless there are many cases of cerebral syphilis in which the results of "606" treatment are equivocal. Six of Klieneberger's twenty-nine patients who were suffering from cerebro-spinal lues were unchanged in their condition. Two of them were hemiplegic. Of the remaining twenty-three, sixteen were relieved, many in a striking way. Three relapsed. One only could be pronounced cured. The excellence of salvarsan in specific disease of the brain lies in its rapidity of action and in the sense of well-being which it induces. He recommends that salvarsan should be combined with mercurial and iodide treatment.

C. B.

Salvarsan in Cerebral Syphilis.—Kahl (*Münch. med. Woch.*, February 20, 1912, p. 440) has collected reports of 190 cases of cerebral syphilis which have been treated with salvarsan. Sometimes it exerts an almost magic action when mercury and iodides have failed. The majority of patients show great improvement, although their recovery is not complete. In a not inconsiderable number, relapses occur. Occasionally the remedy appears to aggravate the disease.

C. B.

Salvarsan in Optic Neuritis.—Lacapère (*Gaz. des Hopitaux*, No. 10, 1912) has observed a retardation in the progress of two cases of optic neuritis in tabetics under repeated intravenous doses of 0·1 to 0·25 grm. of salvarsan. The Wassermann reaction became negative and the lightning pains disappeared. He has not noted any injurious effect on the eye caused by the remedy.

C. B.

Salvarsan in Cerebro-spinal Syphilis.—Antonescu (*Münch. med. Woch.*, January 23, 1912, p. 215) states that, in his experience, the administration of salvarsan improves the general health. His patients gained 4 to 8 kg. in weight. Nevertheless the downward course of general paralysis was unchecked. He noticed some improvement in one case of tabes.

C. B.

Hemiplegia after Salvarsan.—Hoffman (*Münch. med. Woch.*, January 23, 1912, p. 192) relates a case of pareplegia caused by a gumma of the cord in a man, aged 42, five and a half years after infection. Twelve hours after an intravenous injection of 0·6 grm. salvarsan signs of hæmorrhage into the internal capsule came on, of which he died nine days later.

C. B.

Salvarsan in Cerebro-spinal Syphilis.—Postempky (*Münch. med. Woch.*, 1911, p. 2693) observed good effects from the administratlon of salvarsan in twenty-eight cases of cerebral syphilis, some of which were chronic. One case of hemiplegia with spinal meningitis recovered. Two cases of syphilitic epilepsy derived great benefit. Two tabetics were not improved.

Arcangeli (*Munch. med. Woch.*, 1911, p. 2693) reported recoveries under "606" in a case of hemiparesis, and in another of hemiplegia, somnolence and headache. Gianuelli could find no improvement in five general paralytics who had been treated with salvarsan. Mingazzin was also unfavourably impressed with the action of salvarsan in general paralysis. He had seen it give relief to the headache of cerebral syphilis and to the lightning pains of locomotor ataxy, but no permanent improvement ensued.

C. B.

Bacteria and Salvarsan.—W. L. Yakimoff and N. Kohl-Yakimoff (*Münch. med. Woch.*, No. 3, 1912) have published a series of experiments undertaken to determine the effect of the presence of dead bacteria in an injection of salvarsan. These experiments show that the toxicity of salvarsan is increased by bacterial endotoxins as follows:—

B. coli communis	2½	times.
B. coli communis plus mild trypanosome infection	8	,,
B. coli communis plus severe trypanosome infection	16	,,
B. pyocyaneus	2½	,,
B. pyocyaneus plus mild trypanosome infection	3½	,,
Staphylococcus aureus plus mild trypanosome infection.. ..	3½	,,
Pneumobacillus (Friedlander) plus mild trypanosome infection	1½	,,
B. subtilis plus mild trypanosome infection	1½	,,

The Yakimoffs therefore conclude that Wechselmann is right in attributing severe reactions after salvarsan injections to the presence of bacteria in the distilled water.

C. E. P.

Salvarsan in the Blood after Intravenous Injection.—Abelin (*Münch. med. Woch.*, No. 2, 1912) has published the results of some work undertaken to determine how long unaltered salvarsan continues to circulate in the blood.

The test employed was as follows: 5 c.c. to 8 c.c. of blood were withdrawn from a vein into an absolutely dry tube and the serum separated in the centrifuge. The clear serum was then drawn off by means of a fine pipette; 1 c.c. to 2 c.c. were placed in a test tube and acidified by the addition of two drops of dilute hydrochloric acid, after which three drops of ½ per cent solution of sodium nitrite were mixed with the serum. In another test tube 0·3 grm. of pure resorcin or α-naphthol were dissolved in 4 c.c. to 5 c.c. of 30 per cent sodium hydrate solution. The prepared serum was then added drop by drop to the resorcin solution. In the presence of unaltered salvarsan a deep red ring forms at the junction of the fluids; in the absence of salvarsan serum only forms a pale yellow ring.

Each case received an intravenous injection of 0·4 to 0·5 grm. of salvarsan; after varying intervals blood was withdrawn and tested as described above. The results were:—

After intervals of one minute, five minutes, and twenty minutes, the red ring was well marked. After an interval of one hour the red ring was not very pronounced; after an interval of one and a half hours the reaction was doubtful; after an interval of two and a half hours no reaction was obtained. It therefore appears that salvarsan continues to circulate as such in the blood for at least an hour after the injection; the effect of intramuscular injections of salvarsan was not investigated.

C. E. P.

Inoculation of Human Syphilis into Rabbits.—Professor Uhlenhuth (*Berlin. klin. Woch.*, No. 4, 1912) has published a preliminary report on some important experimental work on the communicability of syphilis. The material employed was blood, serum and spermatic fluid obtained from human beings in the secondary stage of syphilis. One of the patients from whom the material was obtained had received no treatment, but the other had received two injections, together containing 1·05 grm. of salvarsan four and a half months previously and had relapsed. In each experiment before injection the fluid was examined in hanging drop preparation with dark-ground illumination, but no spirochætes could be detected. Two cubic centimetres of the fluid were injected into the testis of a rabbit. In three out of four of the rabbits syphilitic orchitis, containing living spirochætes, developed in seven to eight weeks after the inoculation. The investigations are being continued and will, it is hoped, throw considerable light on the problem of the communicability of syphilis, especially in regard to hereditary transmission of the disease. Uhlenhuth also suggests that inoculation of rabbits with blood from a suspected case of syphilis might help to clear up the diagnosis.

C. E. P.

Typhoid Fever in the Philippines.—*The Military Surgeon* for January, 1912, contains an interesting report on typhoid fever in the Philippine Islands, by the United States Army Medical Board for the study of Tropical Diseases as they exist in the Philippines.

The conclusions arrived at are as follows:—

"(1) Typhoid is a widely scattered and common disease in the Philippines; its incidence in Manila is above the average rate for the United States and is exceeded by only a few of the worst American cities. The average admission rate among American soldiers in the Philippines exceeds that for the troops serving in the United States. Medical officers from many regions report its frequent occurrence among the Filipinos.

"(2) The statistics from the Filipino (Native) Scouts show a much lower typhoid rate than for white troops, possibly due to failure to diagnose the atypical cases.

"(3) Widal reactions performed on the blood of 591 healthy Filipinos suggest a comparatively recent attack of typhoid in about 6 per cent of adults, but do not indicate that the disease is prevalent in childhood.

"(4) Many epidemics have occurred among soldiers in the Philippines, and three outbreaks among natives have been studied. Epidemics of great severity among the Filipinos are either rare or unnoticed.

"(5) The occurrence of the disease in the Philippine Islands is quite evenly distributed throughout the year. The incidence is least in the second quarter.

"(6) The appearance of the Widal reaction in typhoid fever in the Philippines is not as a rule delayed.

"(7) Paratyphoid organisms are occasionally isolated in the Philippines.

"(8) The leucocyte count in typhoid remains normal for whites, and is slightly increased for natives. The differential count is normal for both races.

"(9) The mortality for white troops in the Philippine Islands during the last five years has been no higher than at home. It appears somewhat higher for Filipinos, but this may be due to failure to diagnose all the mild cases.

"(10) More than a third of the cases of enteric fever, whether among Americans or Filipinos, are entirely atypical and cannot be diagnosed without laboratory methods.

"(11) Over half of the cases occurring in the Philippine Islands can be diagnosed clinically and differ in no essential particular from typhoid fever as seen at home. This is true for both American and Filipino cases.

"(12) Much work still needs to be done among the natives to estimate the actual amount of mild and atypical typhoid which is occurring, and to determine why extensive and destructive epidemics are not more often seen."

Ambulance Trains, Russia.—(Extract from *Kriegstechnische Zeitschrift*, 1912, p. 32.) The type of ambulance train adopted in Russia in 1904 was found to be quite satisfactory as regards its interior arrangements; unfortunately the supply of Pullman carriages was insufficient, and an inferior type of ambulance train, made up of converted goods vans,

had to be employed. Owing to the length of the regular ambulance trains (290 yards) it was found impossible to keep them ready at the entraining stations, as there were not enough sidings available, consequently they had to be kept at some distance behind the troops—e.g., during the battle of Liao-yang the ambulance trains were collected at Mukden, and similarly during the battle of Mukden the trains were stationed at Charbin. The pressure of army traffic prevented these trains from being brought up in sufficient numbers. The majority of the wounded at Mukden were evacuated in ordinary goods vans which had not been prepared in any way. Even far back on the lines of communication the evacuation of wounded was largely carried out by means of ordinary goods vans; at Irkutsk the proportion carried in fitted ambulance trains was only 42 per cent of the whole.

The new regulations for ambulance trains direct that a "cadre" train is to be formed consisting of a certain number of carriages for personnel, of goods vans carrying equipment for adapting goods vans for ambulance work and of carriages specially fitted up for the conveyance of severely wounded cases.

The "cadre" trains will be of two kinds: (*a*) For use between field ambulances and stationary hospitals on the lines of communication. As these trains are intended to carry a maximum number of patients for a short distance the accommodation provided will be of a simple nature. Each "cadre" train will be split up into three parts, to each of which goods vans will be added to form three temporary ambulance trains, each of which can carry 500 wounded.

(*b*) "Cadre" trains for use between lines of communication medical units and the home territory will consist of Pullman carriages to which passenger corridor carriages will be added to form comfortable ambulance trains. Each of these "cadre" trains will form two ambulance trains capable of transporting 400 patients.

Trials of these trains were held during the manœuvres in the Kieff district in September, 1911. An ambulance train was fitted up in two and a half hours. It carried 11 officers and 321 men comfortably from Lugina to Kieff and was there dismantled. On a subsequent occasion it carried 22 officers, and 460 men from Kieff to Kursk.

The goods vans can be heated by artificial means (method not stated), but there is no corridor communication.

The train inspected by the Czar was 370 yards in length.

C. E. P.

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